

# HARTING



## Metric connectors

## Quality Connections Worldwide

HARTING was founded in 1945 by the family that still owns the company.

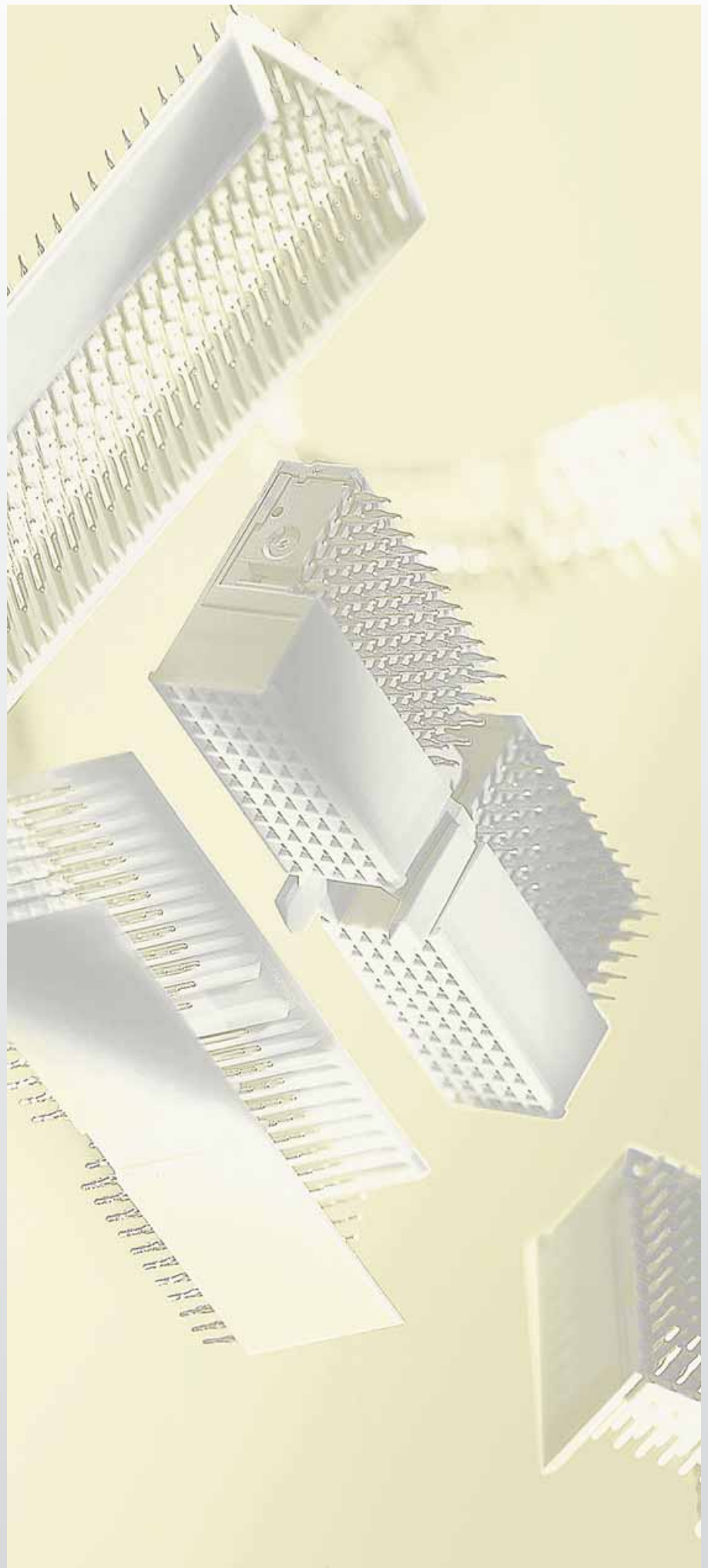
Today, HARTING employs around 2,000 people worldwide, including 150 qualified engineers. The sales team, including more than 100 sales engineers is in daily contact with our customers.

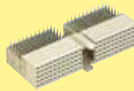
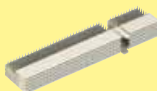
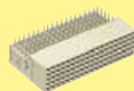
The company is one of the world's leading manufacturers of connectors, and currently have 34 subsidiary companies in Europe, the United States and Asia. In several product areas, HARTING is a market leader.

Great emphasis is placed on close links with customers, including the provision of a 'Just-in-Time'-Service to ensure rapid delivery to key customers.

HARTING products are designed and manufactured using the latest automated techniques, from CAD systems in the research and development department to automatic production techniques on the assembly lines.

Production and quality control is based on a 'zero-error' philosophy which can only be reached by the continuous successful implementation of fully automated production techniques. The organisation and procedures for quality assurance are based on the EN ISO 9001 standard. A total of 60 engineers and other employees, most of whom are trained and qualified to standards laid down by the DGQ (German Association of Quality) or the SAQ (Swiss Association of Quality), are employed solely on quality-assurance activities.



| Metric connectors                                  |                                                                                     |                                                                                       | Chapter           |
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## General information

It is the user's responsibility to check whether the components illustrated in this catalogue comply with different regulations from those stated in special fields of application which we are unable to foresee.

We reserve the right to modify designs in order to improve quality, keep pace with technological advancement or meet particular requirements in production.

This catalogue must not be used in any form or manner without our prior approval in writing (Copyright Law, Fair Trading Law, Civil Code). We are bound by the German version only.



**harbus® HM** – general information

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Design according : IEC 61 076 - 4 - 101

#### Approvals

Underwriters

Laboratories Inc.®

VDE, IECQ, CECC

:  us with their respective ratings documented in file E 102079  
: Technology approval certificate, no. 127250 and no. 127244

Number of contacts : 55 – 220 signal (77 – 308 fully shielded); or customised

Contact spacing : 2.00 mm

Working current : 1.5 ADC (Signal) max.

Test voltage  $U_{r.m.s.}$  : AC 750 V min.

Contact resistance : 20 mΩ max.

Insulation resistance : 10 GΩ min.

Temperature range : – 55 °C ... + 125 °C

Durability as per  
IEC 61076-4-101

: Performance level 2 = 250 mating cycles in total.

*First 125 mating cycles*, then 4 days gas test using 0.5 ppm SO<sub>2</sub>  
and 0.1 ppm H<sub>2</sub>S (at 25 ± 2 °C and 75 ± 3 % humidity).

Measurement of contact resistance.

The *remaining 125 mating cycles* are subject to measurement of contact  
resistance and visual inspection. No abrasion of the contact finish through  
to the base material. No functional impairment.

Performance level 1 = 500 mating cycles in total.

*First 250 mating cycles*, then 10 days gas test using 0.5 ppm SO<sub>2</sub>  
and 0.1 ppm H<sub>2</sub>S (at 25 ± 2 °C and 75 ± 3 % humidity).

Measurement of contact resistance.

The *remaining 250 mating cycles* are subject to measurement of contact  
resistance and visual inspection. No abrasion of the contact finish through  
to the base material. No functional impairment.

Termination technique : **compliant press-in**

Press-in force\* : 100 N/pin max.

Parameters like hole dimension, board thickness and hole surface  
influence the resulting press-in force.

Typical measurements

| Board finish | Press-in force (N/pin) |
|--------------|------------------------|
| tin          | 40                     |
| bare copper  | 35                     |
| gold         | 33                     |

Retention force : 20 N/pin min.

Mating force : 0.75 N/pin max.

Withdrawal force : 0.15 N/pin min.

#### Materials

Mouldings : Thermoplastic resin, glass-fibre filled, UL 94-V0

Contacts : Copper alloy

Contact surface : Au/Ni, male and female contacts are treated with Belcore recommended  
lubricant (PPE)

Packaging : Tube (standard) or cardboard box

\* For further details see chapter 15

Due to the high deformation capability and resilience of **harbus<sup>®</sup> HM** press-in contacts, they can be easily and repeatedly removed in case of repairs without impairment to their functioning.

Today tinned surfaces are widely used as a standard, the pcb technology trends are moving to low tin or tin free surfaces. Cu, Pd, Au and Ag are the important alternatives. Specific parameters and particularly different friction factors of these surfaces make high demands on press-in zones.

**harbus<sup>®</sup> HM** press-in contacts are extremely versatile and offer a reliable electrical contact, therefore they are especially well suited for applications with these surfaces.

Please contact us for detailed test reports.

## Benefits of press-in technology

- Thermal shocks associated with the soldering process and the risk of the board malfunction are avoided.
- No need for the subsequent cleaning of the assembled pcb's
- Unlimited and efficient processing of partially gold-plated pins for rear I/O - manual soldering is no longer necessary!

## Recommended configuration of plated through holes for tinned pcb's

Diameter of holes:  $0.6 \pm 0.05$  mm

Pcb thickness: 1.4 mm min.

Configuration: Drilling:  $0.7 \pm 0.02$  mm  
Cu: 30 - 50  $\mu$ m  
SnPb: 5 - 15  $\mu$ m

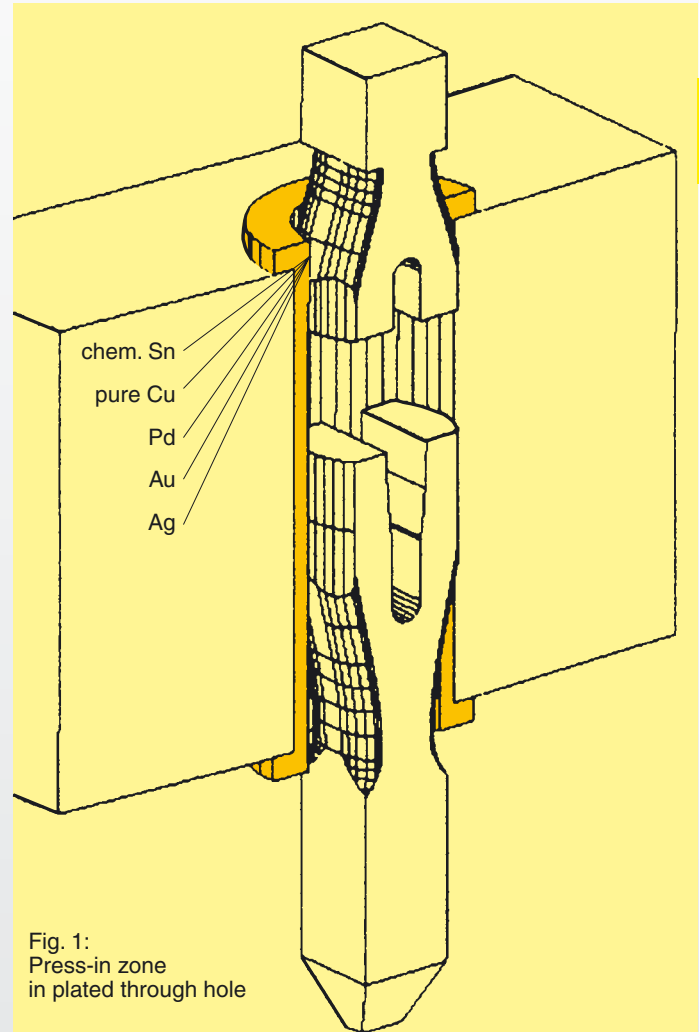


Fig. 1:  
Press-in zone  
in plated through hole

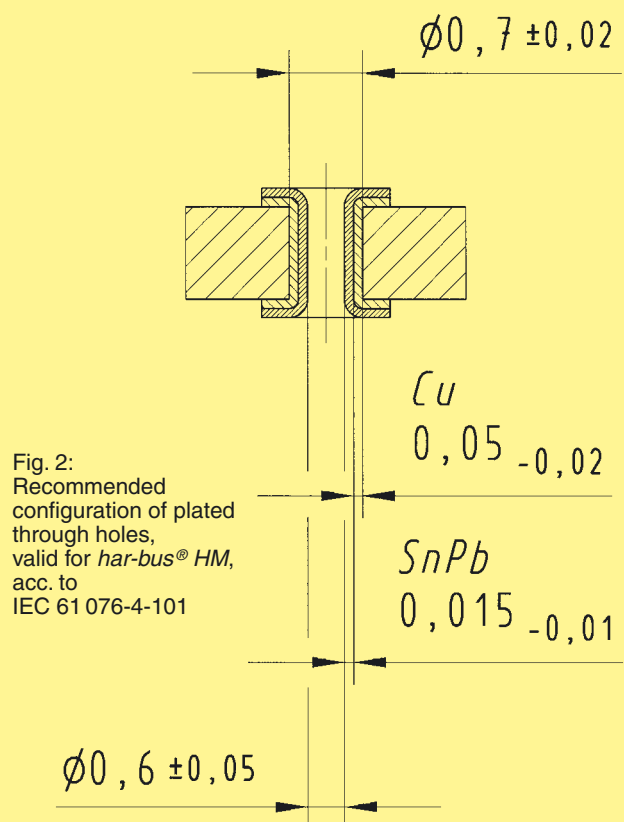


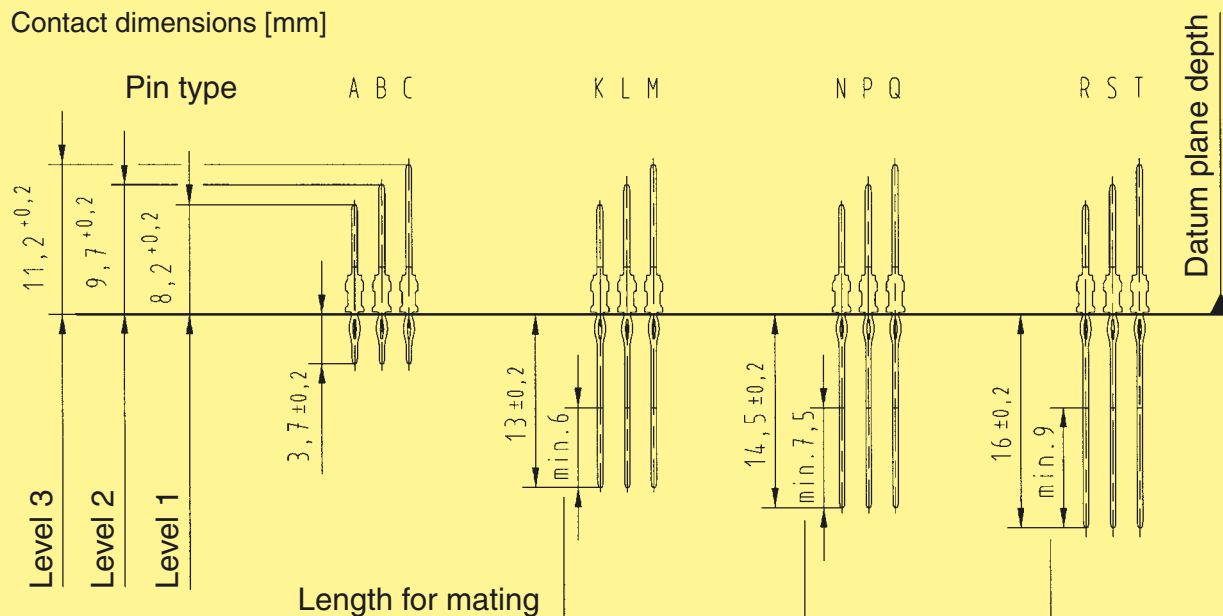
Fig. 2:  
Recommended  
configuration of plated  
through holes,  
valid for **harbus<sup>®</sup> HM**,  
acc. to  
IEC 61 076-4-101

HARTING offers 12 standard contact lengths for *har-bus® HM* male connectors: the standard mating length of 8.2 mm, pre-leading contacts with 9.7 mm and extra long contacts preferred for shielding with 11.2 mm mating length. On the termination side the standard length is 3.7 mm. With the three termination lengths of 13.0, 14.5 and 16.0 mm even for rear I/O applications different mating levels are possible, depending on the pcb thickness and shroud height.

The different contact lengths are designated with letters to identify them in the configurations. For special loadings please use the customer request form at the end of this catalogue.

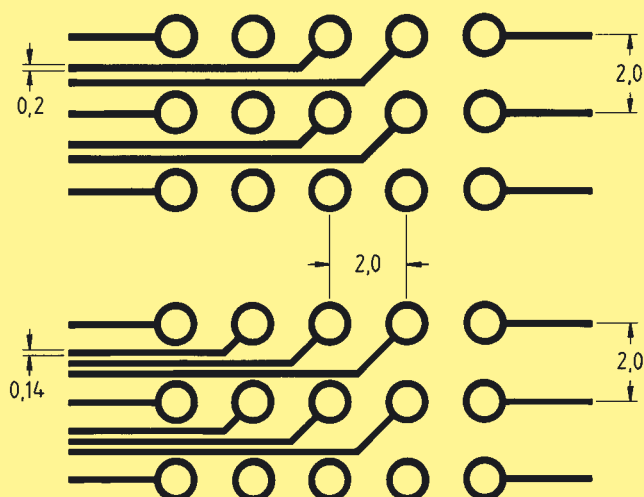
All contacts are offered with press-in termination 'eye of the needle'. In accordance of the application they can be delivered in performance level 1 or 2.

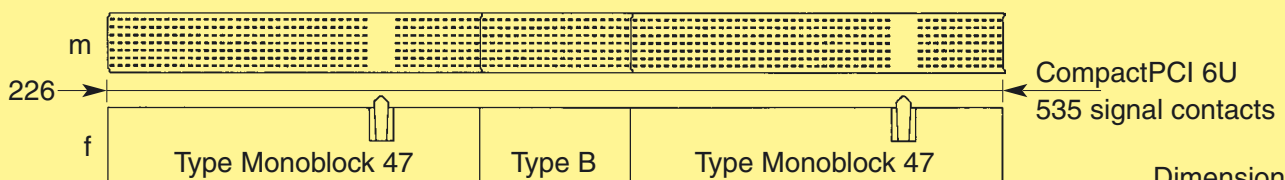
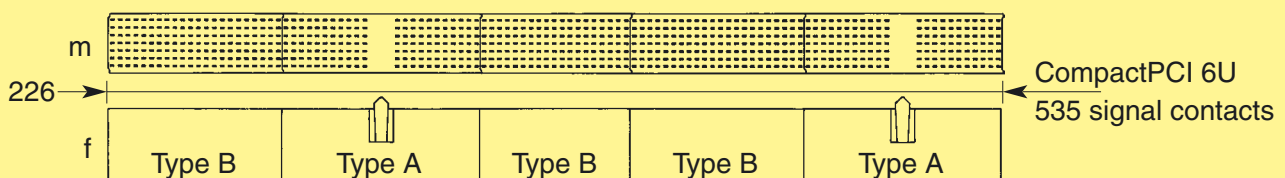
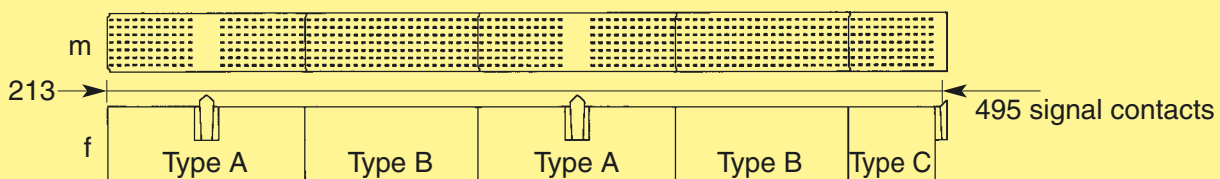
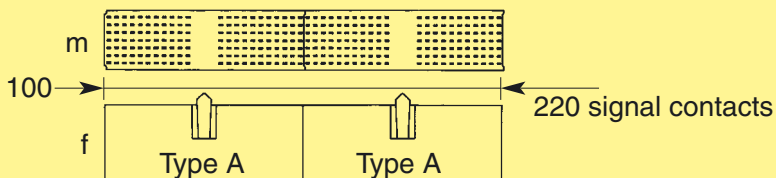
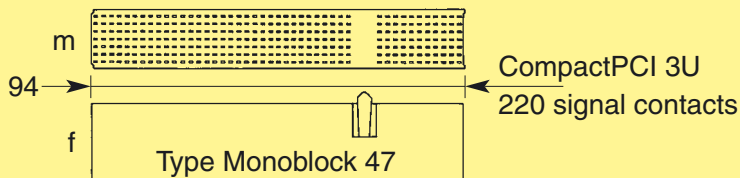
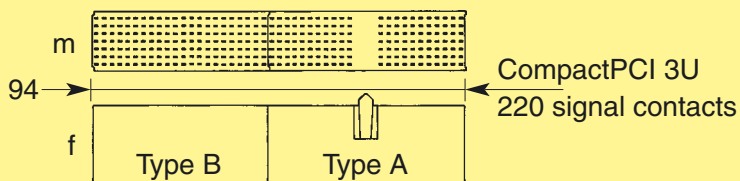
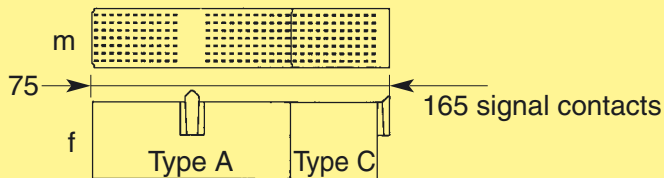
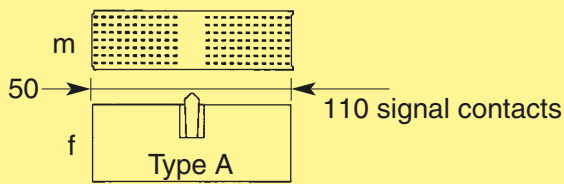
Contact dimensions [mm]



## Circuit density

When using the recommended diameter of the finished through hole ( $0.6 \pm 0.05$  mm) with an appropriate annular ring, the remaining distance between the rings is about 1 mm. Under the condition that the width of the track and the space between should be equal, two tracks of 0.2 mm width or three tracks of 0.14 mm width can be placed between two rings. Typical designs are shown in the drawing on the right side.





Dimensions [mm]

All HARTING *har-bus*® HM connectors can be assembled end to end in any configuration.

General rules:

- Type B connectors should always be used in combination with a type A and/or type C connectors that are fitted with alignment features.
- Type C connectors must be assembled at the end of a connector stack, to achieve polarisation and avoid mismatching.
- To ensure the correct slot position of connector stacks coding can be added with style A connectors.
- Starting with an A module (50 mm) any module can be added within the above recommendation (see typical examples shown in the diagram).

m = male connector  
f = female connector

### Improved guiding with AB-modules:

In accordance with the equipment practice each front side arrangement of *har-bus*® HM connectors shall have at least one A-module per slot to ensure that the connector can accommodate  $\pm 2$  mm alignment tolerances in rack systems.

On some rear I/O arrangements the A-module's alignment capability cannot be utilised, because only B-modules are used for feed through. Consequently AB-modules were introduced to ensure guiding capabilities where formerly only B-modules were used. Those AB-modules represent a combination of A- and B-modules and are specified in **CompactPCI by PICMG 2.0 Rev. 3.0** for certain rear I/O applications.

The AB-modules have guiding pegs similar (but not mating compatible to prevent mismating) to those of

the A-module providing the same proven mating tolerances of  $\pm 2$  mm. The AB-modules have no coding center but are fully equipped with contacts in order to maintain the full density as per the B-modules.

The **AB-female** connector mates either with an **AB-shroud** or with **AB-male** connectors. The centered pin positions of the shielding rows of male connectors are simply equipped with short spill contacts (if standard connector and shroud are used). This prevents that the guiding peg of the female AB-module stubbing on the feed through contacts of the front side's fixed connector. These fixed connector loadings are called **AB-friendly**.

The AB-male connector will not be equipped with shielded contacts in the centre where the guiding peg will engage.

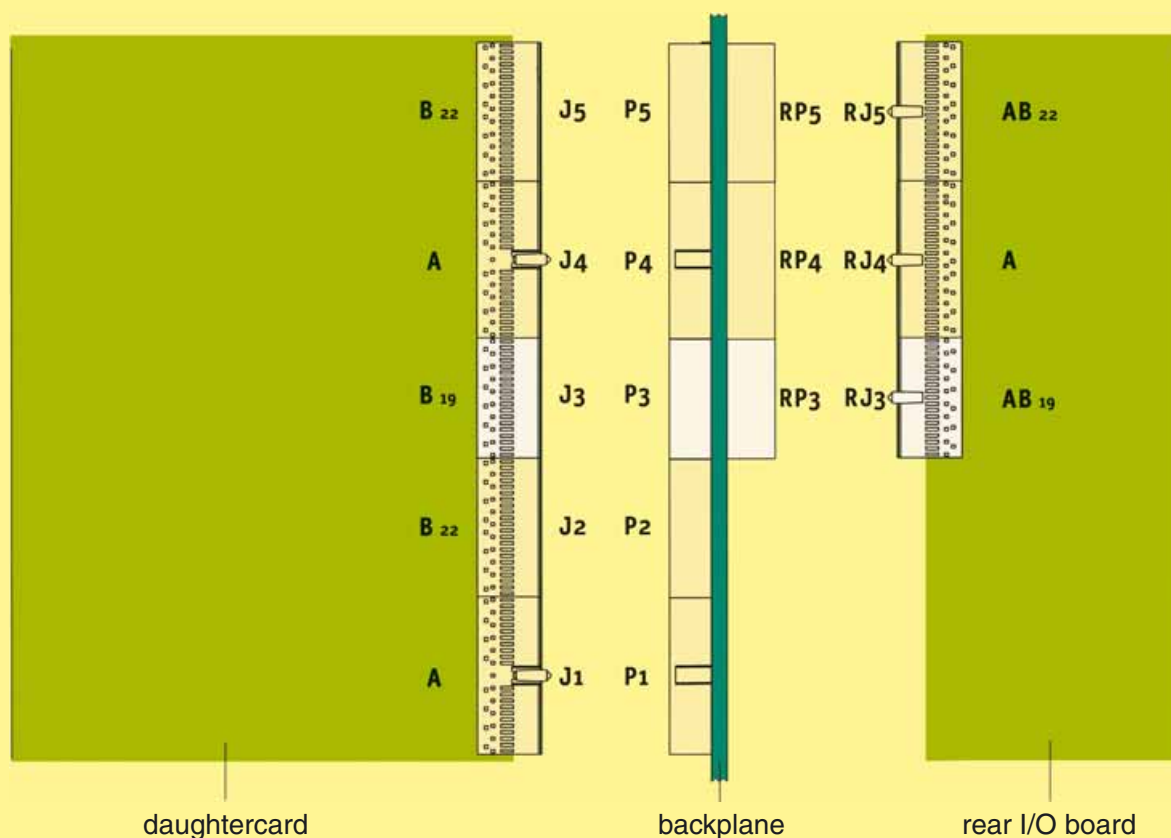


Fig. 3: CompactPCI 6U configuration



## Types with 5+2 rows

Page

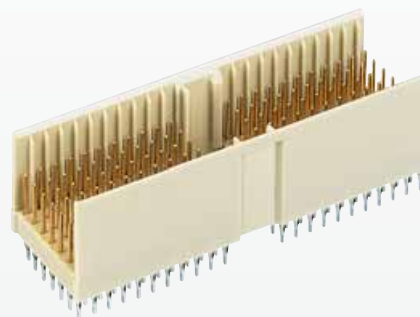
***Straight male connectors***

|                                  |       |
|----------------------------------|-------|
| Type A .....                     | 01.02 |
| Type B (incl. AB-friendly) ..... | 01.06 |
| Type AB .....                    | 01.12 |
| Type C .....                     | 01.16 |
| Type Monoblock 47 see chapter 03 |       |

***Angled female connectors***

|                                  |       |
|----------------------------------|-------|
| Type A .....                     | 01.18 |
| Type B .....                     | 01.19 |
| Type AB .....                    | 01.20 |
| Type C .....                     | 01.21 |
| Type Monoblock 47 see chapter 03 |       |

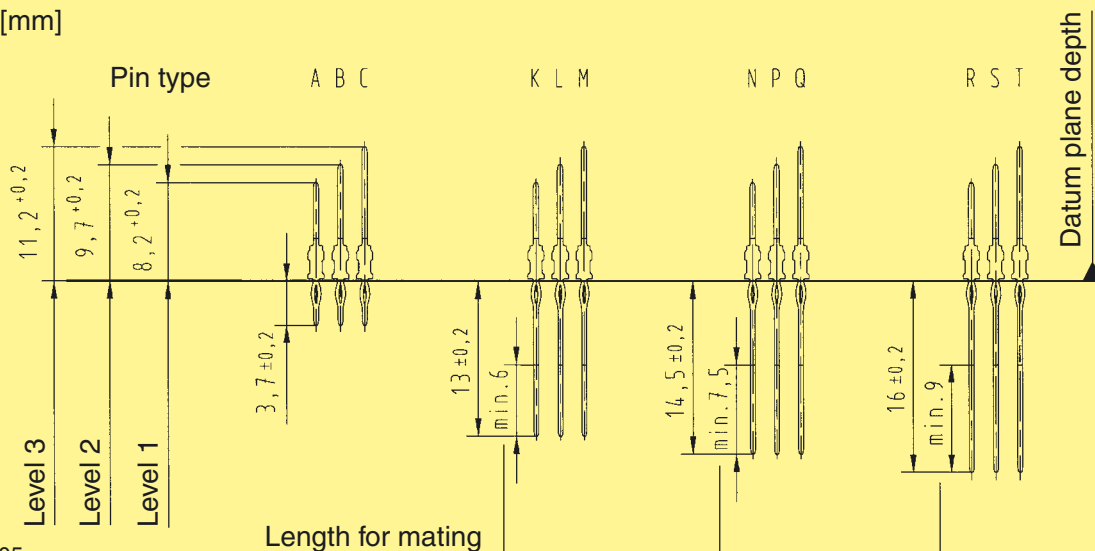
Types with  
5+2 rows



## Male connectors, straight

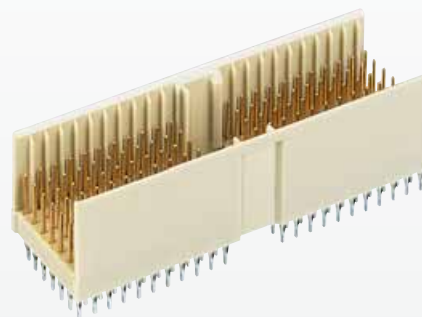
| Identification | Number of contacts | Contact length [mm]<br>mating side termination side | Part number                      | Contact configuration |
|----------------|--------------------|-----------------------------------------------------|----------------------------------|-----------------------|
| Type A         | 110                | 8.2 3.7                                             | 17 01 110 1201<br>17 01 110 2201 |                       |
| Type A         | 154                | 8.2/<br>11.2 3.7                                    | 17 01 154 1201<br>17 01 154 2201 |                       |
| Type A         | 110                | 9.7 3.7                                             | 17 01 110 1204<br>17 01 110 2204 |                       |
| Type A         | 154                | 9.7/<br>11.2 3.7                                    | 17 01 154 1205<br>17 01 154 2205 |                       |

## Contact dimensions [mm]



Connector dimensions see page 01.05

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

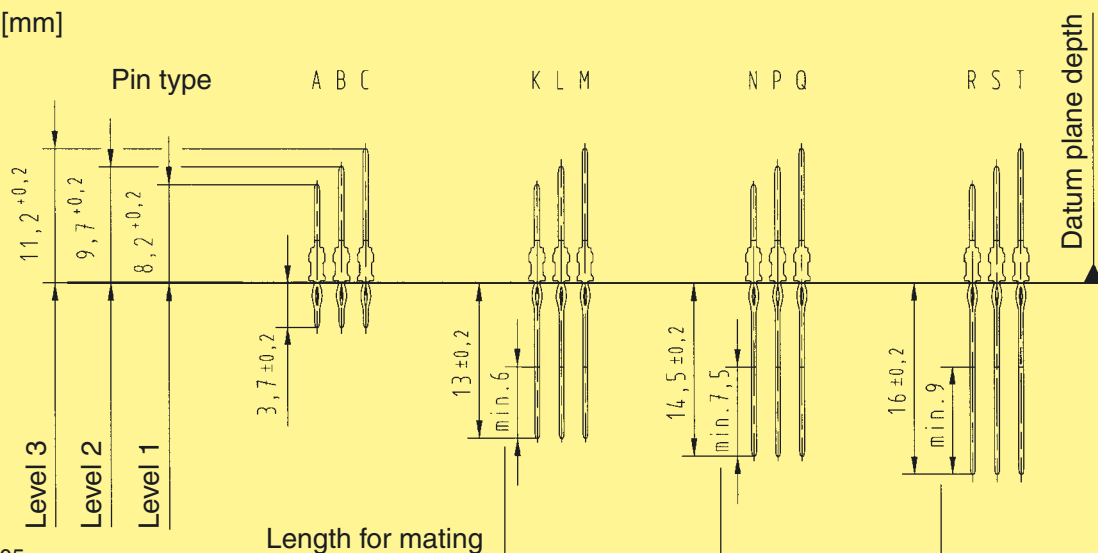


Types with  
5+2 rows

Male connectors, straight

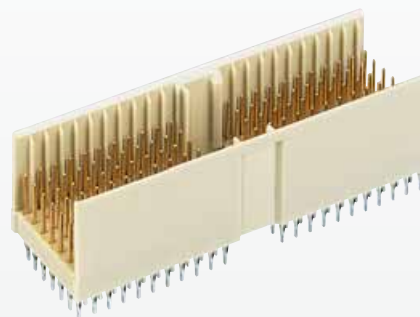
| Identification     | Number of contacts | Contact length [mm]<br>mating side termination side | Part number   | Contact configuration            |
|--------------------|--------------------|-----------------------------------------------------|---------------|----------------------------------|
| Type A             | 110                | 8.2                                                 | 13.0          | 17 01 110 1402<br>17 01 110 2402 |
| Type A             | 154                | 9.7/<br>11.2                                        | 14.5/<br>16.0 | 17 01 154 1001<br>17 01 154 2001 |
| Type A, CompactPCI | 154                | 8.2/<br>9.7/<br>11.2                                | 3.7           | 17 01 154 1203<br>17 01 154 2203 |
| Type A, CompactPCI | 154                | 9.7/<br>11.2                                        | 16.0          | 17 01 154 1604<br>17 01 154 2604 |

Contact dimensions [mm]



Connector dimensions see page 01.05

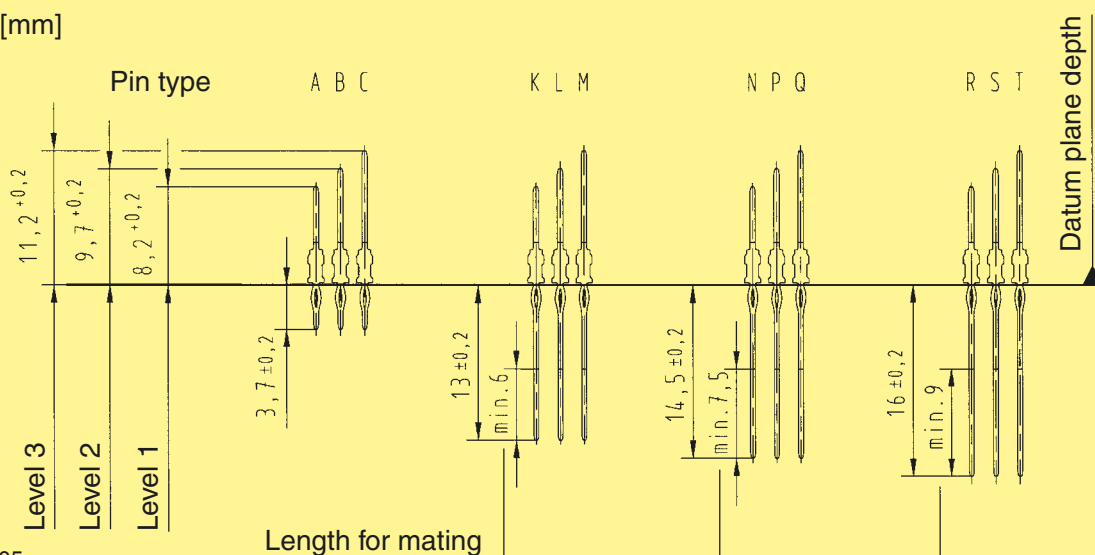
Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**



### Male connectors, straight

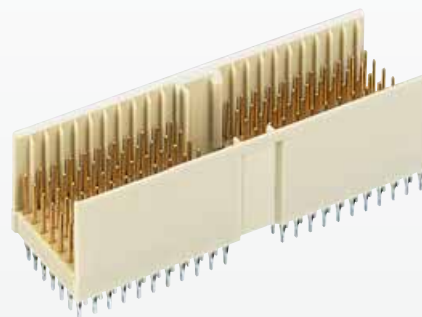
| Identification                       | Number of contacts | Contact length [mm]<br>mating side termination side | Part number            | Contact configuration                   |
|--------------------------------------|--------------------|-----------------------------------------------------|------------------------|-----------------------------------------|
| Type A, CompactPCI                   | 154                | 8.2/<br>9.7/<br>11.2                                | 16.0                   | 17 01 154 1603<br><b>17 01 154 2603</b> |
| Type A, CompactPCI hot swap          | 154                | 8.2/<br>9.7/<br>11.2                                | 3.7                    | 17 01 154 1204<br><b>17 01 154 2204</b> |
| Type A CompactPCI computer telephony | 100                | 8.2/<br>9.7/<br>11.2                                | 13.0/<br>14.5/<br>16.0 | 17 01 100 1001<br><b>17 01 100 2001</b> |
| Type A CompactPCI computer telephony | 100                | 8.2/<br>9.7/<br>11.2                                | 3.7                    | 17 01 100 1201<br><b>17 01 100 2201</b> |

### Contact dimensions [mm]



Connector dimensions see page 01.05

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**



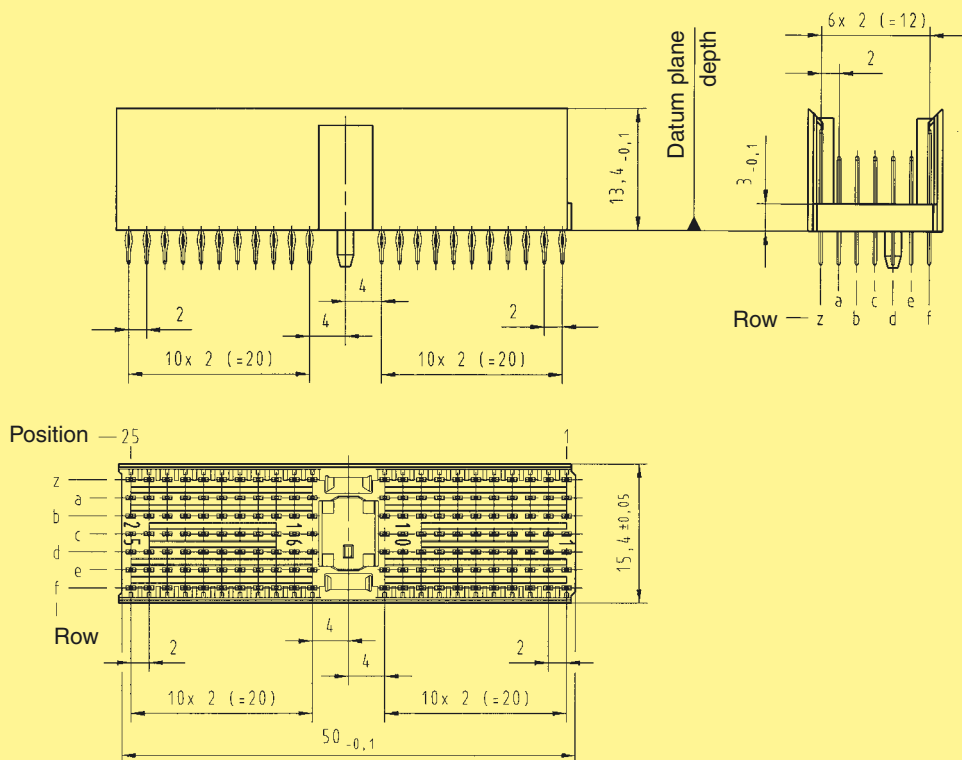
## Male connectors, straight

Types with  
5+2 rows

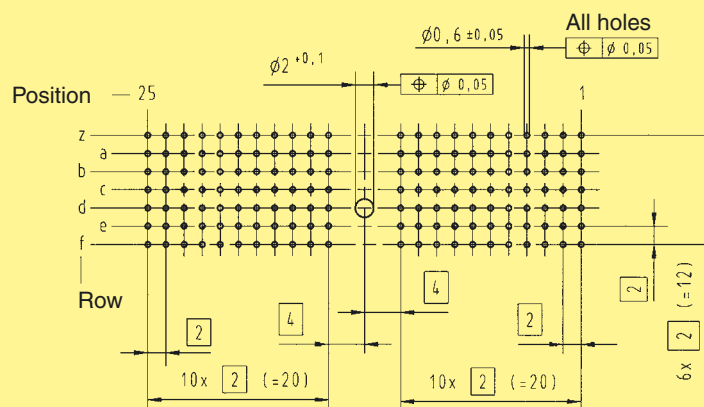
### Drawing

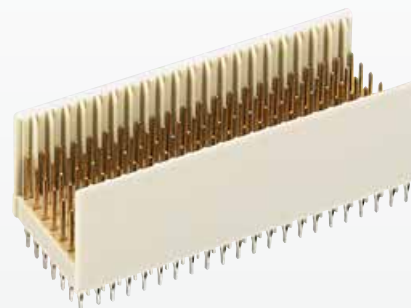
Dimensions in mm

### Connector dimensions [mm]



### Board drillings

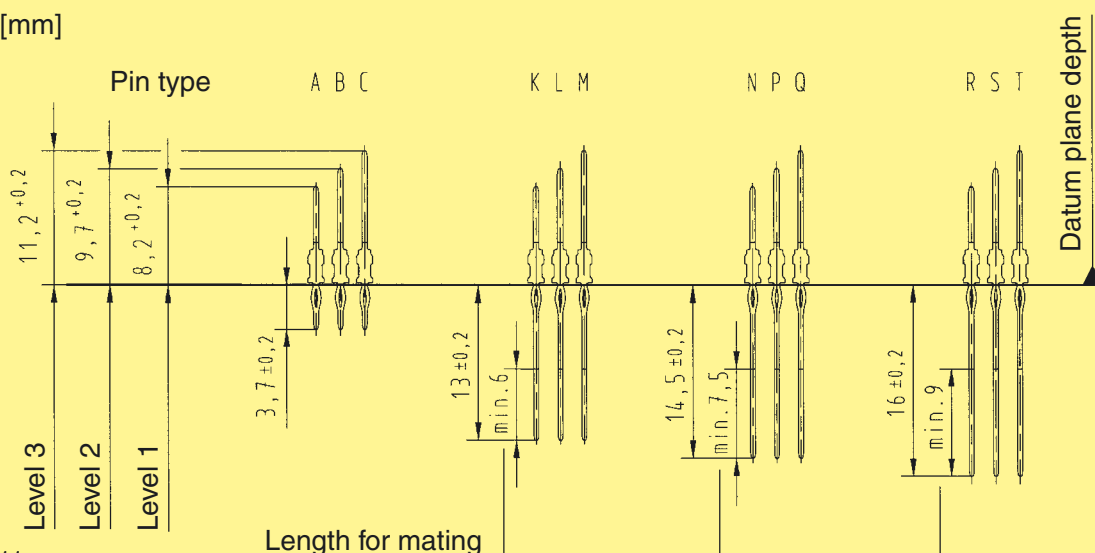




### Male connectors, straight

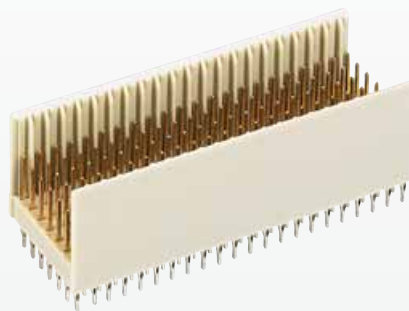
| Identification | Number of contacts | Contact length [mm]<br>mating side termination side | Part number                             | Contact configuration |
|----------------|--------------------|-----------------------------------------------------|-----------------------------------------|-----------------------|
| Type B         | 125                | 8.2 3.7                                             | 17 02 125 1201<br><b>17 02 125 2201</b> |                       |
| Type B         | 175                | 8.2/<br>11.2 3.7                                    | 17 02 175 1201<br><b>17 02 175 2201</b> |                       |
| Type B         | 175                | 8.2/<br>9.7/<br>11.2 3.7                            | 17 02 175 1202<br><b>17 02 175 2202</b> |                       |
| Type B         | 110                | 8.2 3.7                                             | 17 04 110 1201<br><b>17 04 110 2201</b> |                       |

### Contact dimensions [mm]



Connector dimensions see page 01.11

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

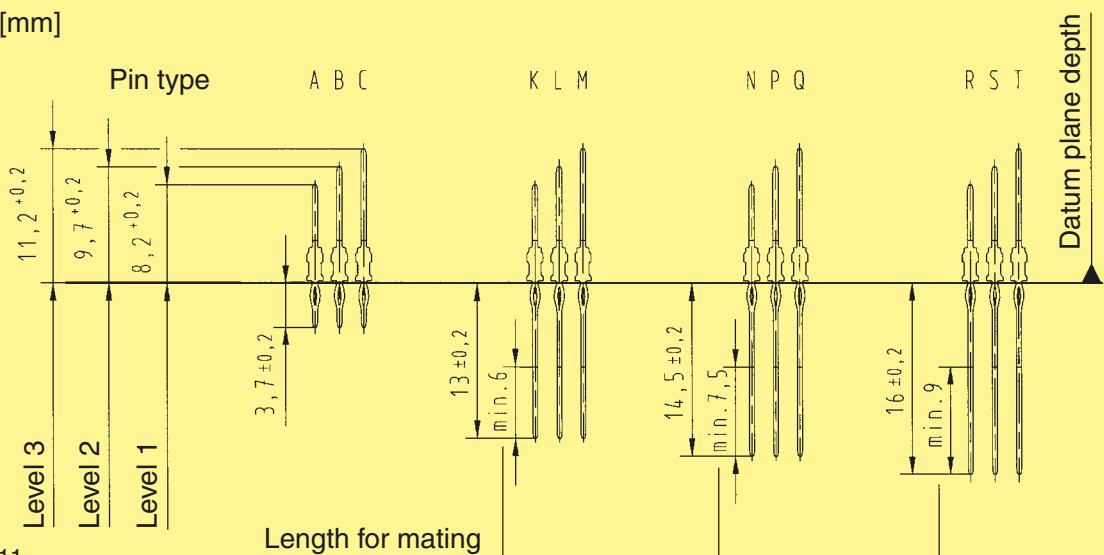


Types with  
5+2 rows

Male connectors, straight

| Identification                        | Number of contacts | Contact length [mm]<br>mating side termination side | Part number                                                           | Contact configuration |
|---------------------------------------|--------------------|-----------------------------------------------------|-----------------------------------------------------------------------|-----------------------|
| Type B                                | 154                | 8.2/<br>11.2                                        | 3.7<br><br>17 04 154 1201<br><b>17 04 154 2201</b>                    |                       |
| Type B, CompactPCI                    | 154                | 9.7/<br>11.2                                        | 3.7<br><br>17 04 154 1203<br><b>17 04 154 2203</b>                    |                       |
| Type B, CompactPCI computer telephony | 132                | 8.2/<br>9.7/<br>11.2                                | 13.0/<br>14.5/<br>16.0<br><br>17 04 132 1001<br><b>17 04 132 2001</b> |                       |
| Type B, CompactPCI computer telephony | 154                | 8.2/<br>9.7/<br>11.2                                | 3.7<br><br>17 04 154 1204<br><b>17 04 154 2204</b>                    |                       |

Contact dimensions [mm]



Connector dimensions see page 01.11

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

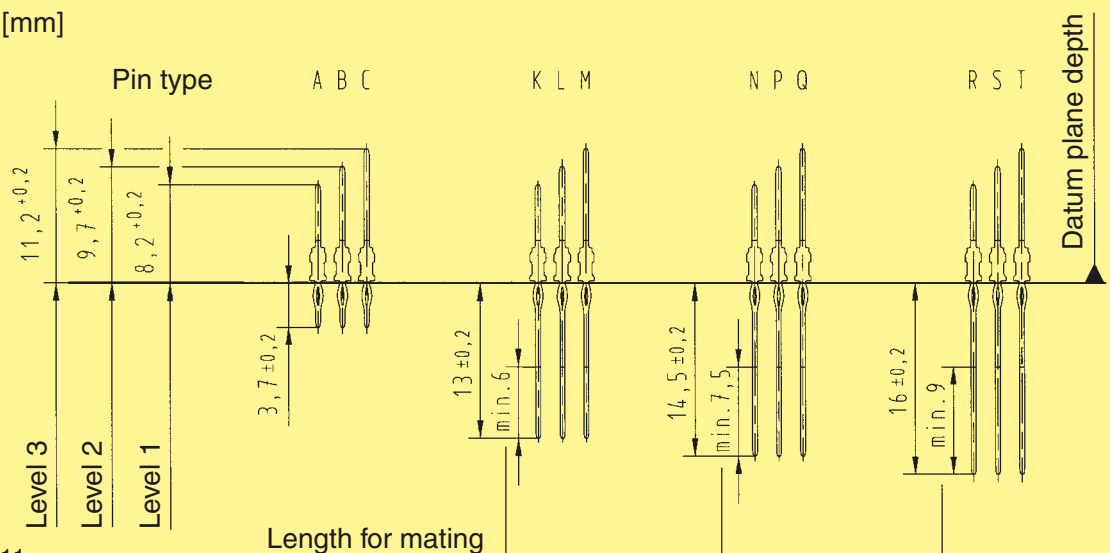




## Male connectors, straight

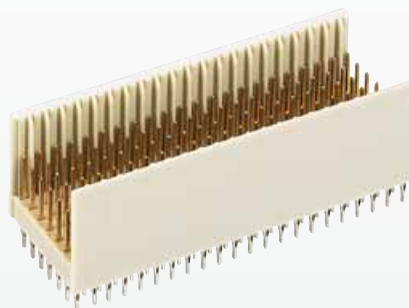
| Identification                        | Number of contacts | Contact mating side  | Contact length [mm] termination side | Part number                             | Contact configuration |
|---------------------------------------|--------------------|----------------------|--------------------------------------|-----------------------------------------|-----------------------|
| Type B, CompactPCI computer telephony | 132                | 8.2/<br>9.7/<br>11.2 | 3.7                                  | 17 04 132 1201<br><b>17 04 132 2201</b> |                       |
| Type B, CompactPCI I/O                | 154                | 9.7/<br>11.2         | 16.0                                 | 17 04 154 1601<br><b>17 04 154 2601</b> |                       |
| Type B, CompactPCI AB friendly        | 154                | 9.7/<br>11.2         | 3.7/<br>16.0                         | 17 04 154 1010<br><b>17 04 154 2010</b> |                       |
| Type B, CompactPCI AB friendly        | 154                | 9.7/<br>11.2         | 3.7/<br>14.5/<br>16.0                | 17 04 154 1002<br><b>17 04 154 2002</b> |                       |

## Contact dimensions [mm]



Connector  
dimensions see page 01.11

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

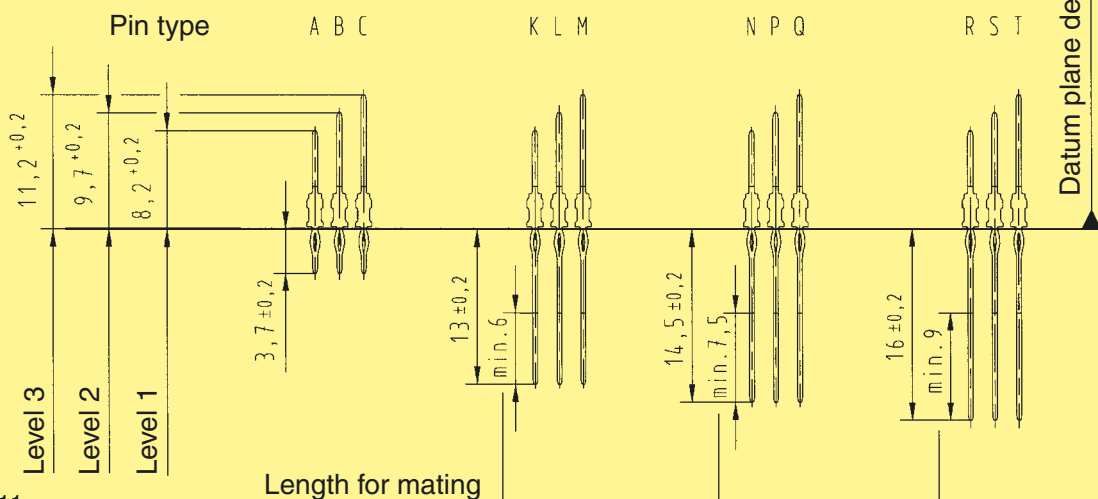


Types with  
5+2 rows

### Male connectors, straight

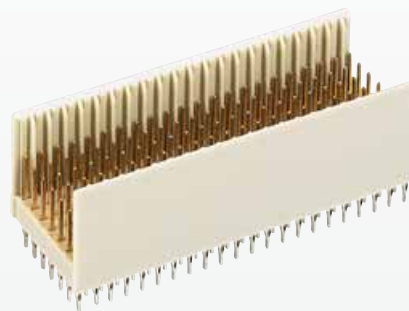
| Identification                       | Number of contacts | Contact length [mm]<br>mating side<br>termination side | Part number                                                 | Contact configuration |
|--------------------------------------|--------------------|--------------------------------------------------------|-------------------------------------------------------------|-----------------------|
| Type B,<br>CompactPCI<br>AB friendly | 154                | 8.2/<br>11.2                                           | 3.7/<br>16.0<br><br>17 04 154 1006<br><b>17 04 154 2006</b> |                       |
| Type B                               | 95                 | 8.2                                                    | 3.7<br><br>17 05 095 1201<br><b>17 05 095 2201</b>          |                       |
| Type B                               | 133                | 8.2/<br>11.2                                           | 3.7<br><br>17 05 133 1201<br><b>17 05 133 2201</b>          |                       |
| Type B                               | 133                | 9.7/<br>11.2                                           | 3.7<br><br>17 05 133 1203<br><b>17 05 133 2203</b>          |                       |

### Contact dimensions [mm]



Connector dimensions see page 01.11

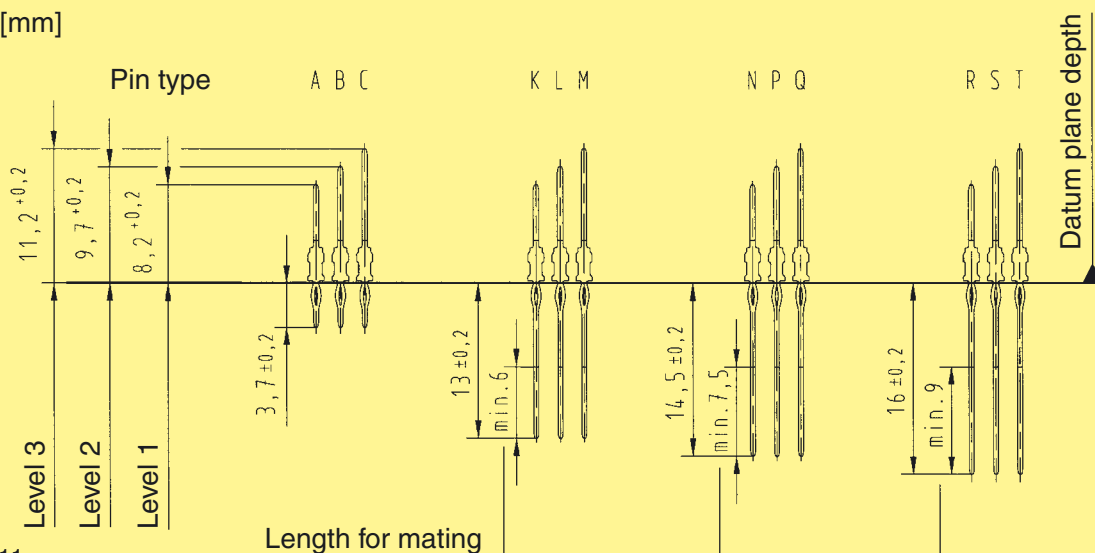
Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**



## Male connectors, straight

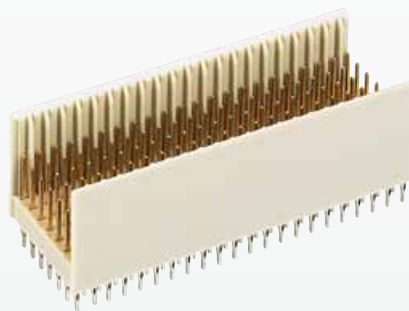
| Identification                 | Number of contacts | Contact length [mm]<br>mating side termination side | Part number                             | Contact configuration |
|--------------------------------|--------------------|-----------------------------------------------------|-----------------------------------------|-----------------------|
| Type B                         | 95                 | 8.2 13.0                                            | 17 05 095 1401<br><b>17 05 095 2401</b> |                       |
| Type B, CompactPCI AB friendly | 133                | 9.7/<br>11.2 3.7/<br>16.0                           | 17 05 133 1005<br><b>17 05 133 2005</b> |                       |
| Type B, CompactPCI AB friendly | 133                | 9.7/<br>11.2 3.7/<br>14.5/<br>16.0                  | 17 05 133 1004<br><b>17 05 133 2004</b> |                       |
| Type B, CompactPCI AB friendly | 133                | 8.2/<br>11.2 3.7/<br>16.0                           | 17 05 133 1002<br><b>17 05 133 2002</b> |                       |

## Contact dimensions [mm]



Connector dimensions see page 01.11

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

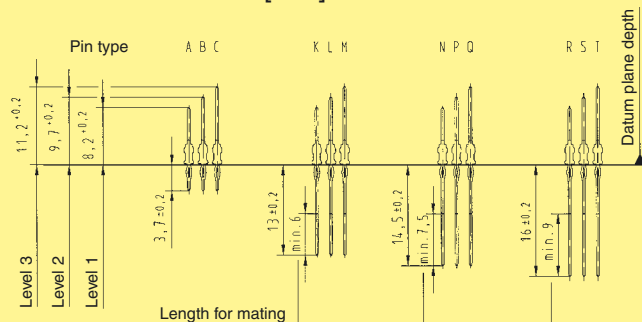


Types with  
5+2 rows

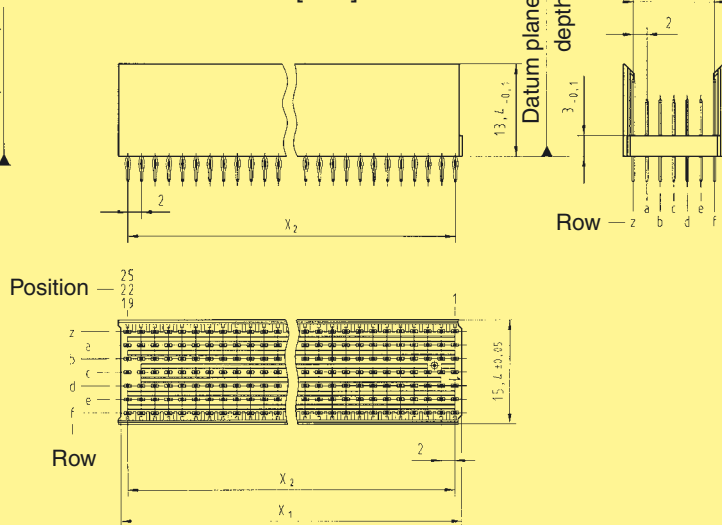
### Male connectors, straight

| Identification         | Number of contacts | Contact length [mm]<br>mating side<br>termination side | Part number | Contact configuration            |
|------------------------|--------------------|--------------------------------------------------------|-------------|----------------------------------|
| Type B,<br>Compact PCI | 133                | 9.7/<br>11.2                                           | 16.0        | 17 05 133 1603<br>17 05 133 2603 |
| Type B,<br>Compact PCI | 133                | 8.2/<br>11.2                                           | 16.0        | 17 05 133 1602<br>17 05 133 2602 |

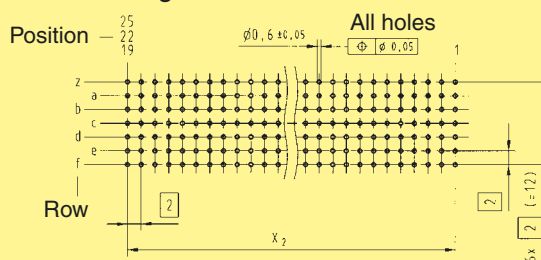
### Contact dimensions [mm]



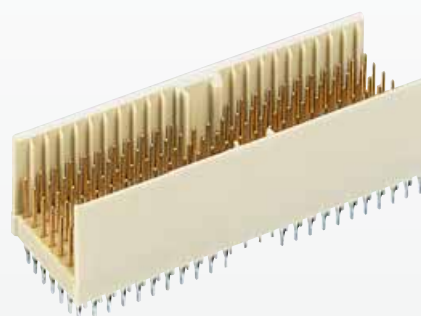
### Connector dimensions [mm]



### Board drillings



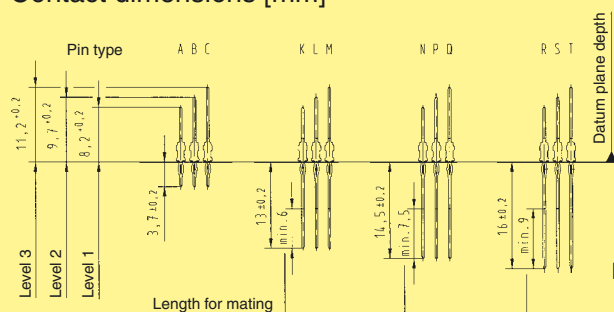
| Contact positions | x <sub>1</sub> | x <sub>2</sub> |
|-------------------|----------------|----------------|
| 19                | 37.9           | 18 x 2 (= 36)  |
| 22                | 43.9           | 21 x 2 (= 42)  |
| 25                | 49.9           | 24 x 2 (= 48)  |



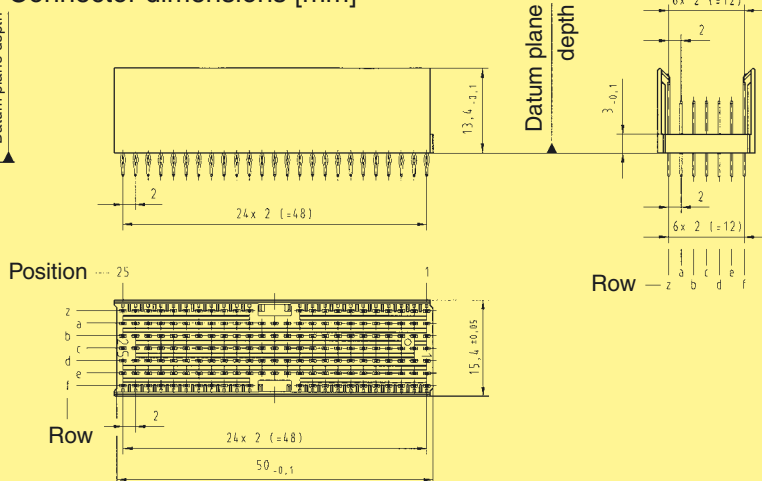
### Male connectors, straight

| Identification | Number of contacts | Contact length [mm]<br>mating side termination side | Part number                      | Contact configuration |
|----------------|--------------------|-----------------------------------------------------|----------------------------------|-----------------------|
| Type AB        | 125                | 8.2 3.7                                             | 17 15 125 1201<br>17 15 125 2201 |                       |
| Type AB        | 169                | 8.2/<br>11.2 3.7                                    | 17 15 169 1201<br>17 15 169 2201 |                       |

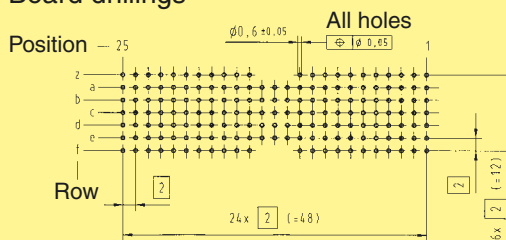
### Contact dimensions [mm]

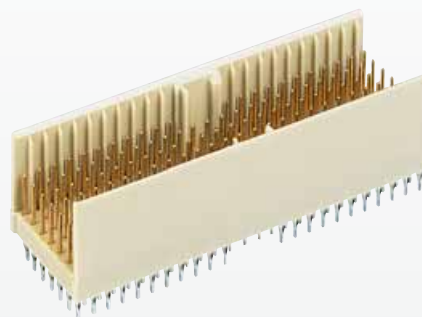


### Connector dimensions [mm]



### Board drillings



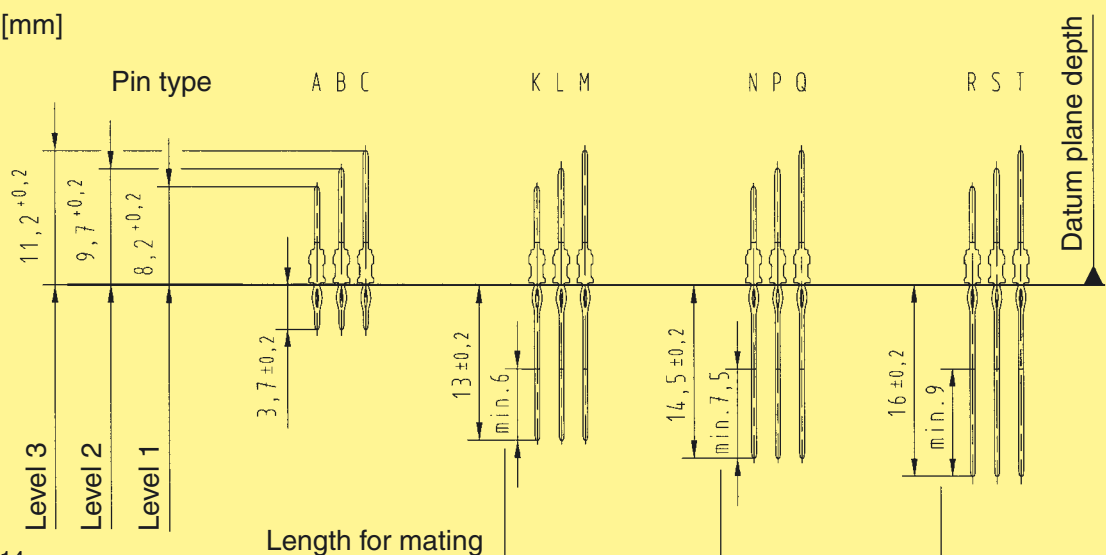


Types with  
5+2 rows

Male connectors, straight

| Identification | Number of contacts | Contact length [mm]<br>mating side termination side | Part number                      | Contact configuration |
|----------------|--------------------|-----------------------------------------------------|----------------------------------|-----------------------|
| Type AB        | 110                | 8.2 3.7                                             | 17 14 110 1201<br>17 14 110 2201 |                       |
| Type AB        | 146                | 8.2/11.2 3.7                                        | 17 14 146 1201<br>17 14 146 2201 |                       |
| Type AB        | 146                | 9.7/11.2 3.7                                        | 17 14 146 1202<br>17 14 146 2202 |                       |
| Type AB        | 146                | 9.7/11.2 16.0                                       | 17 14 146 1601<br>17 14 146 2601 |                       |

Contact dimensions [mm]



Connector dimensions see page 01.14

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

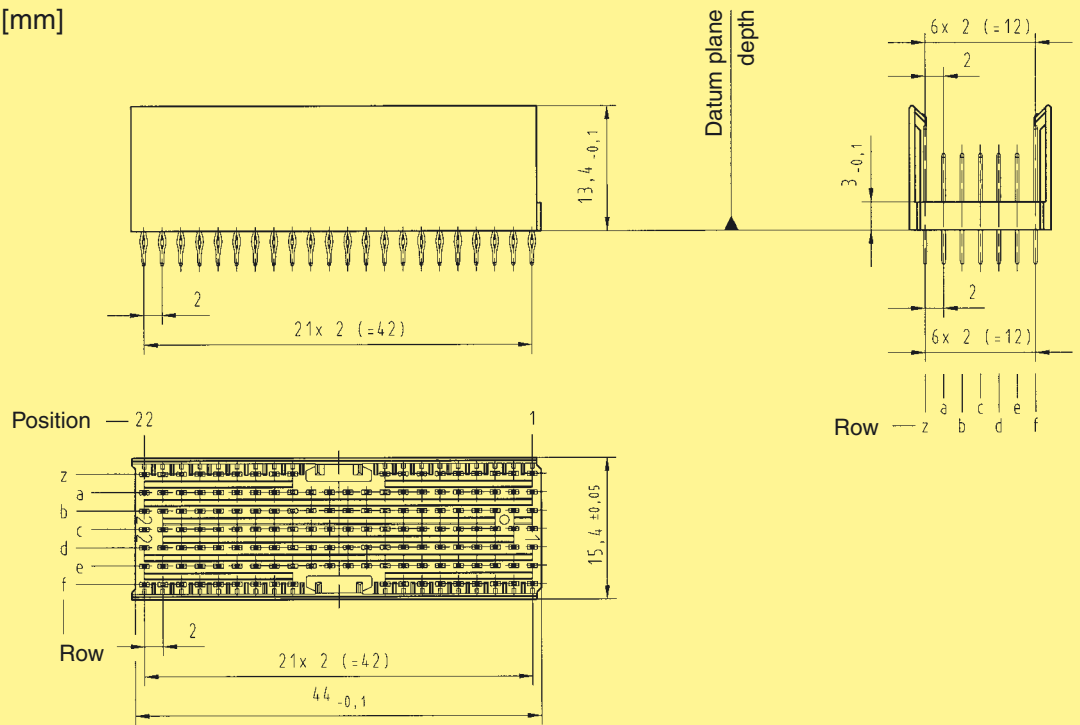


## Male connectors, straight

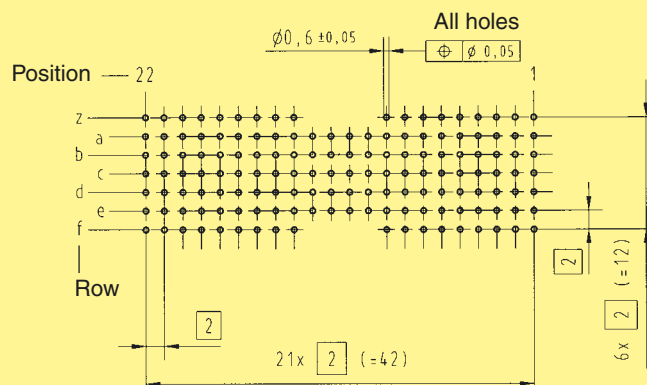
Drawing

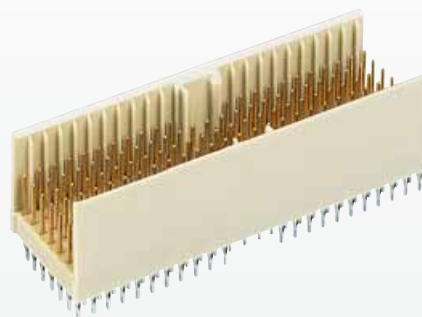
Dimensions in mm

Connector dimensions [mm]



## Board drillings



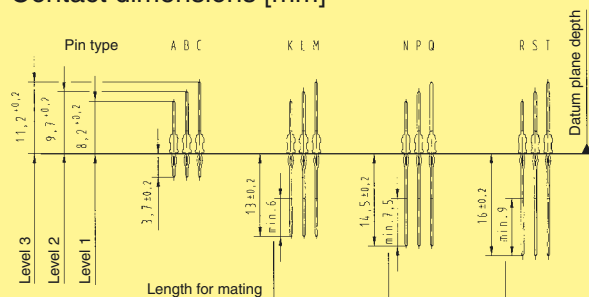


Types with  
5+2 rows

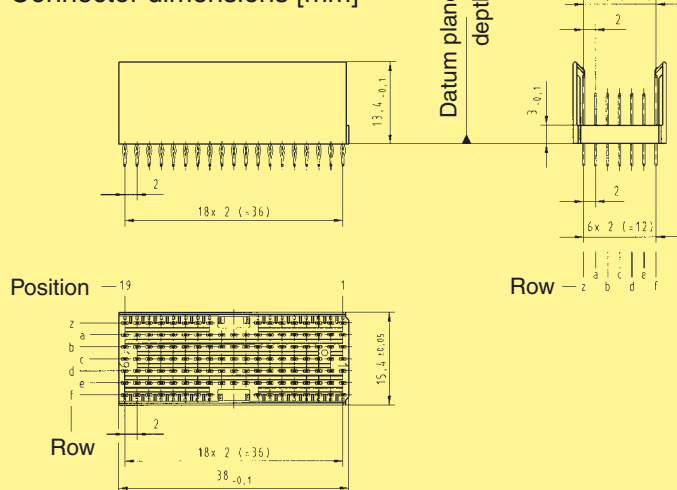
### Male connectors, straight

| Identification | Number of contacts | Contact length [mm]<br>mating side<br>termination side | Part number                             | Contact configuration |
|----------------|--------------------|--------------------------------------------------------|-----------------------------------------|-----------------------|
| Type AB        | 95                 | 8.2<br>3.7                                             | 17 13 095 1201<br><b>17 13 095 2201</b> |                       |
| Type AB        | 127                | 8.2/<br>11.2<br>3.7                                    | 17 13 127 1201<br><b>17 13 127 2201</b> |                       |
| Type AB        | 127                | 9.7/<br>11.2<br>3.7                                    | 17 13 127 1202<br><b>17 13 127 2202</b> |                       |
| Type AB        | 127                | 9.7/<br>11.2<br>16.0                                   | 17 13 127 1601<br><b>17 13 127 2601</b> |                       |

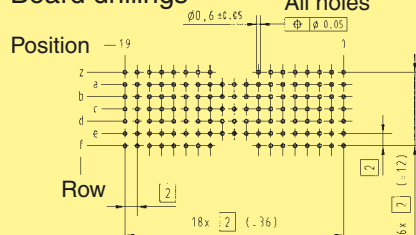
### Contact dimensions [mm]



### Connector dimensions [mm]

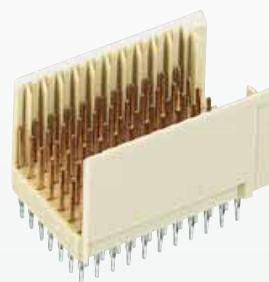


### Board drillings



Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

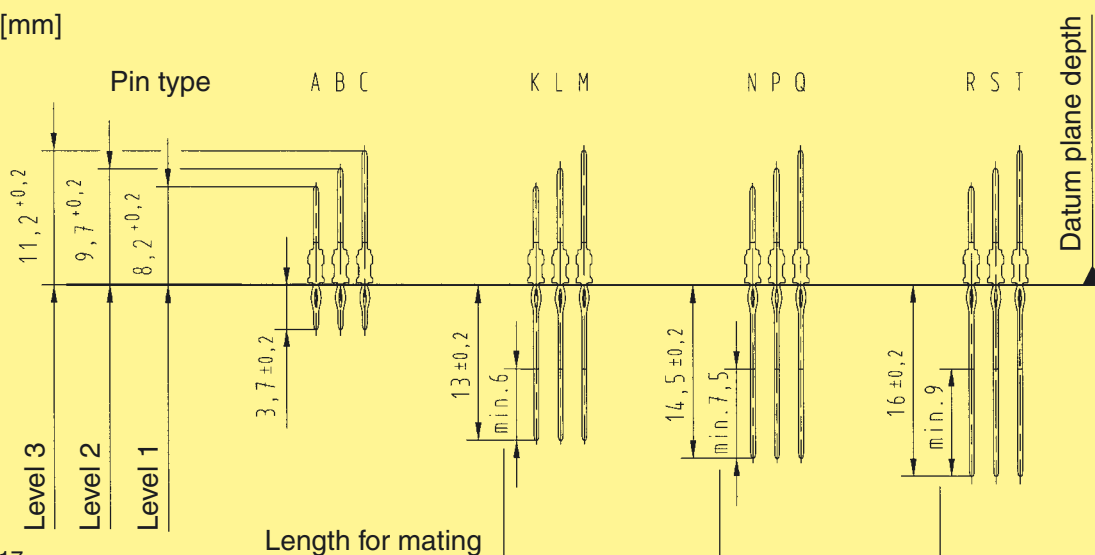




## Male connectors, straight

| Identification | Number of contacts | Contact length [mm]<br>mating side termination side | Part number                             | Contact configuration |
|----------------|--------------------|-----------------------------------------------------|-----------------------------------------|-----------------------|
| Type C         | 55                 | 8.2 3.7                                             | 17 03 055 1201<br><b>17 03 055 2201</b> |                       |
| Type C         | 77                 | 8.2/<br>11.2 3.7                                    | 17 03 077 1201<br><b>17 03 077 2201</b> |                       |
| Type C         | 55                 | 9.7 3.7                                             | 17 03 055 1202<br><b>17 03 055 2202</b> |                       |
| Type C         | 77                 | 9.7/<br>11.2 3.7                                    | 17 03 077 1202<br><b>17 03 077 2202</b> |                       |

## Contact dimensions [mm]



Connector dimensions see page 01.17

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

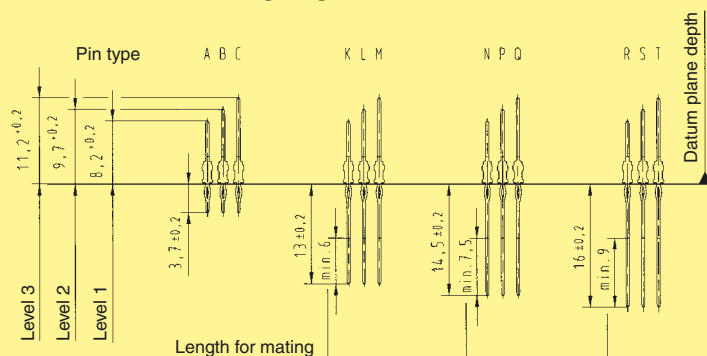


Types with  
5+2 rows

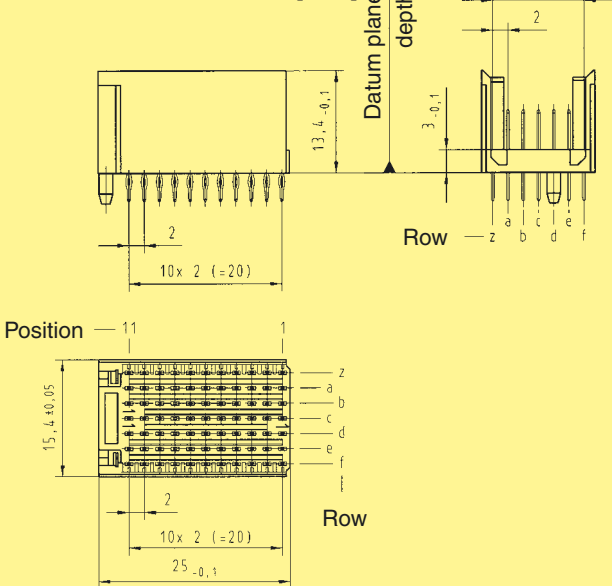
### Male connectors, straight

| Identification | Number of contacts | Contact length [mm]<br>mating side | termination side | Part number                             | Contact configuration |
|----------------|--------------------|------------------------------------|------------------|-----------------------------------------|-----------------------|
| Type C         | 55                 | 8.2                                | 13.0             | 17 03 055 1401<br><b>17 03 055 2401</b> |                       |
| Type C         | 77                 | 8.2/<br>11.2                       | 3.7/<br>13.0     | 17 03 077 1001<br><b>17 03 077 2001</b> |                       |

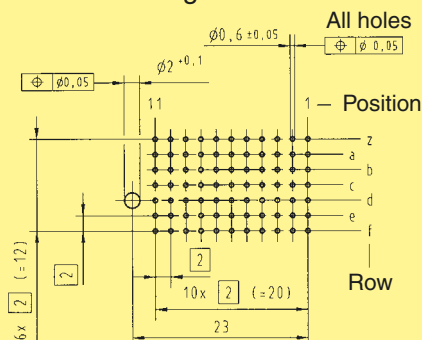
### Contact dimensions [mm]

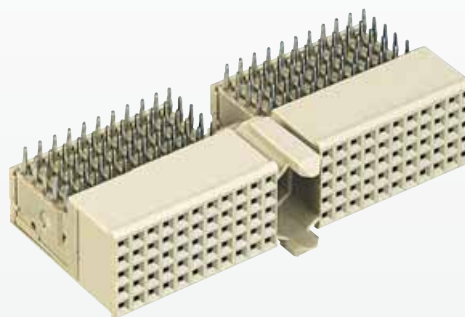


### Connector dimensions [mm]



### Board drillings

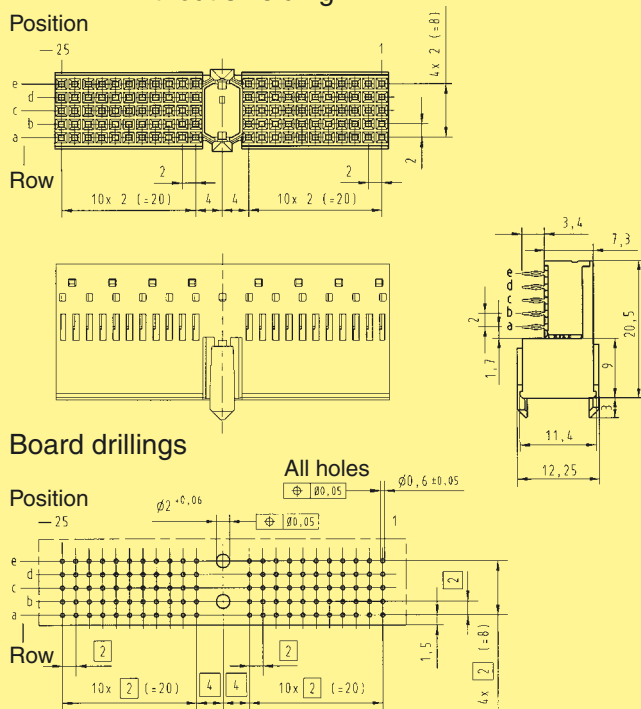




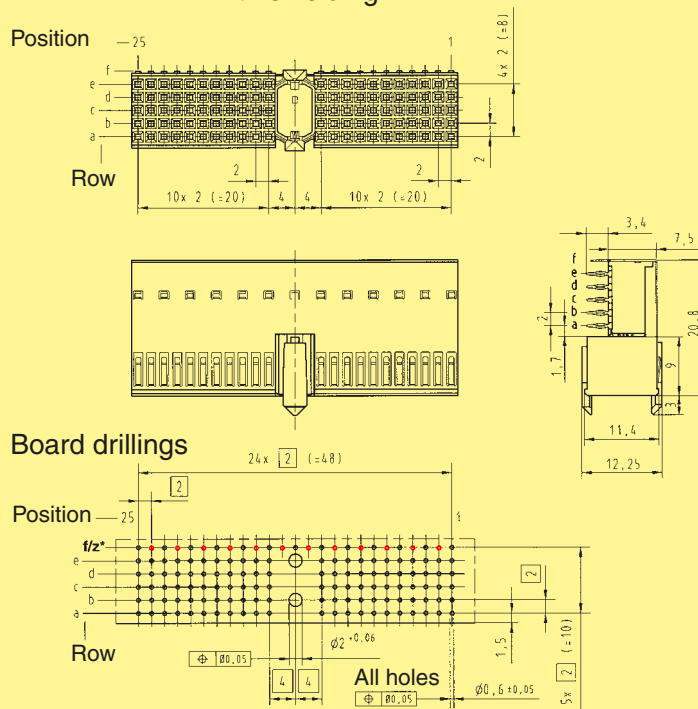
## Female connectors, angled

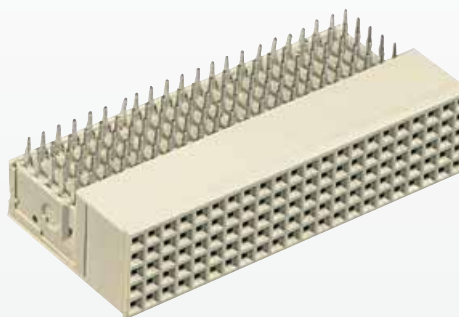
| Identification                                                                         | No. of contacts | Contact length [mm]<br>termination<br>side | Part number                             |  |
|----------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-----------------------------------------|--|
| Type A                                                                                 | 110             | 3.4                                        | 17 21 110 1101<br><b>17 21 110 2101</b> |  |
| Type A,<br>with upper shield                                                           | 110             | 3.4                                        | 17 21 110 1102<br><b>17 21 110 2102</b> |  |
| Lower shield<br>for type A connectors                                                  |                 |                                            | 17 21 000 4102                          |  |
| Type A,<br>with split upper shield<br>CompactPCI computer telephony                    | 90              | 3.4                                        | 17 21 090 1103<br><b>17 21 090 2103</b> |  |
| Lower shield<br>for type A connectors (rows 1 – 5),<br>CompactPCI computer telephony   |                 |                                            | 17 29 000 4102                          |  |
| Lower shield<br>for type A connectors (rows 15 – 25),<br>CompactPCI computer telephony |                 |                                            | 17 23 000 4102                          |  |

## Without shielding



## With shielding





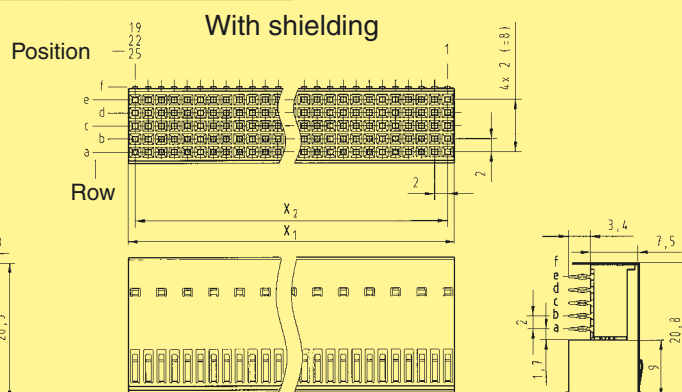
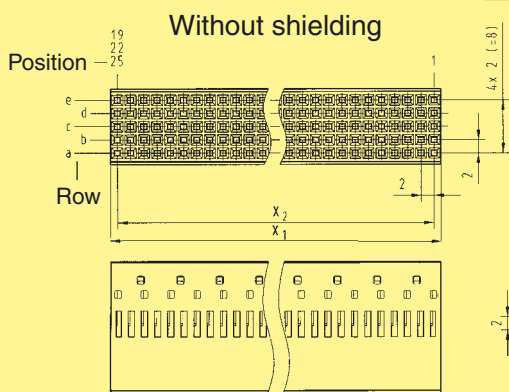
### Female connectors, angled

Types with  
5+2 rows

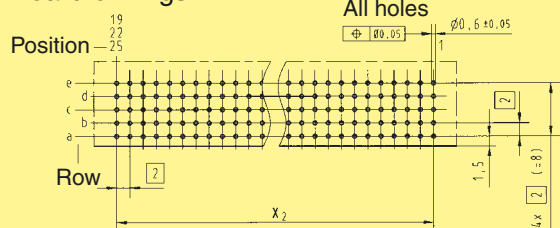
| Identification                                          | No. of contacts | Contact length [mm]<br>termination<br>side | Part number                             |  |
|---------------------------------------------------------|-----------------|--------------------------------------------|-----------------------------------------|--|
| Type B                                                  | 95              | 3.4                                        | 17 25 095 1101<br><b>17 25 095 2101</b> |  |
| Type B,<br>with upper shield                            | 95              | 3.4                                        | 17 25 095 1102<br><b>17 25 095 2102</b> |  |
| Lower shield<br>for type B connectors with 95 contacts  |                 |                                            | 17 25 000 4102                          |  |
| Type B                                                  | 110             | 3.4                                        | 17 24 110 1101<br><b>17 24 110 2101</b> |  |
| Type B,<br>with upper shield                            | 110             | 3.4                                        | 17 24 110 1102<br><b>17 24 110 2102</b> |  |
| Lower shield<br>for type B connectors with 110 contacts |                 |                                            | 17 24 000 4102                          |  |
| Type B                                                  | 125             | 3.4                                        | 17 22 125 1101<br><b>17 22 125 2101</b> |  |
| Type B,<br>with upper shield                            | 125             | 3.4                                        | 17 22 125 1102<br><b>17 22 125 2102</b> |  |
| Lower shield<br>for type B connectors with 125 contacts |                 |                                            | 17 22 000 4102                          |  |

| Contact positions | x <sub>1</sub> | x <sub>2</sub> |
|-------------------|----------------|----------------|
| 19                | 37.9           | 18 x 2 (= 36)  |
| 22                | 43.9           | 21 x 2 (= 42)  |
| 25                | 49.9           | 24 x 2 (= 48)  |

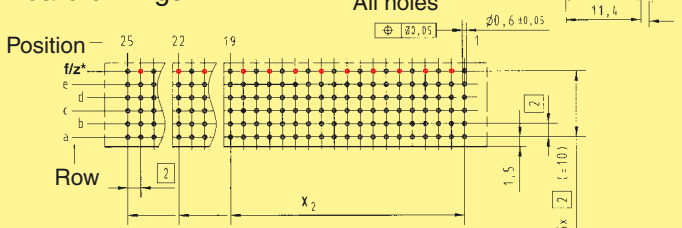
Dimensions [mm]



#### Board drillings

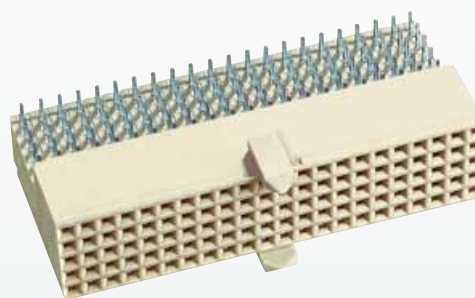


#### Board drillings



Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

\* hole on even contact numbers  
 only needed for lower shielding

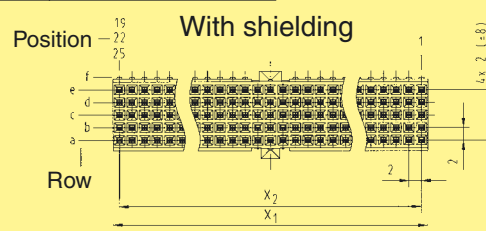
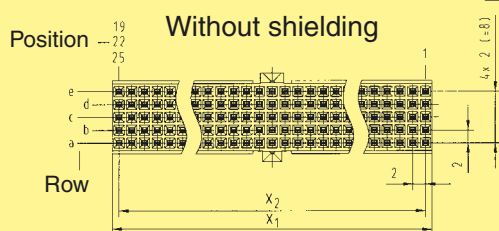


## Female connectors, angled

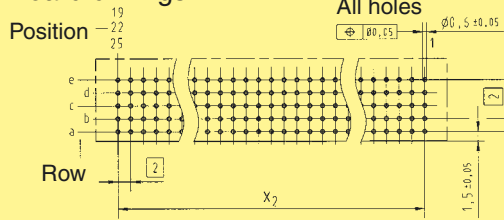
| Identification                                           | No. of contacts | Contact length [mm]<br>termination side | Part number                             |  |
|----------------------------------------------------------|-----------------|-----------------------------------------|-----------------------------------------|--|
| Type AB                                                  | 95              | 3.4                                     | 17 33 095 1101<br><b>17 33 095 2101</b> |  |
| Type AB,<br>with upper shield                            | 95              | 3.4                                     | 17 33 095 1102<br><b>17 33 095 2102</b> |  |
| Lower shield<br>for type AB connectors with 95 contacts  |                 |                                         | 17 33 000 4102                          |  |
| Type AB                                                  | 110             | 3.4                                     | 17 34 110 1101<br><b>17 34 110 2101</b> |  |
| Type AB,<br>with upper shield                            | 110             | 3.4                                     | 17 34 110 1102<br><b>17 34 110 2102</b> |  |
| Lower shield<br>for type AB connectors with 110 contacts |                 |                                         | 17 34 000 4102                          |  |
| Type AB                                                  | 125             | 3.4                                     | 17 35 125 1101<br><b>17 35 125 2101</b> |  |
| Type AB,<br>with upper shield                            | 125             | 3.4                                     | 17 35 125 1102<br><b>17 35 125 2102</b> |  |
| Lower shield<br>for type AB connectors with 125 contacts |                 |                                         | 17 21 000 4102                          |  |

| Contact positions | x <sub>1</sub> | x <sub>2</sub>       |
|-------------------|----------------|----------------------|
| 19                | 37.9           | 18 x <b>2</b> (= 36) |
| 22                | 43.9           | 21 x <b>2</b> (= 42) |
| 25                | 49.9           | 24 x <b>2</b> (= 48) |

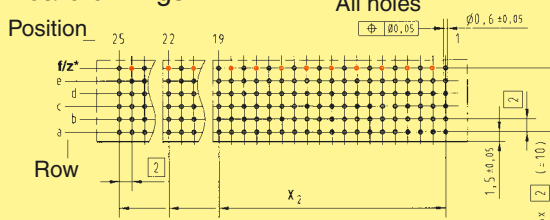
Dimensions [mm]

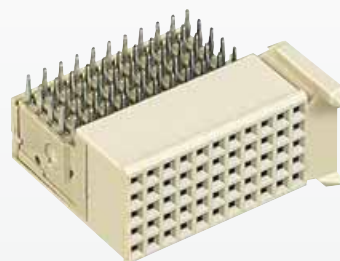


## Board drillings



## Board drillings

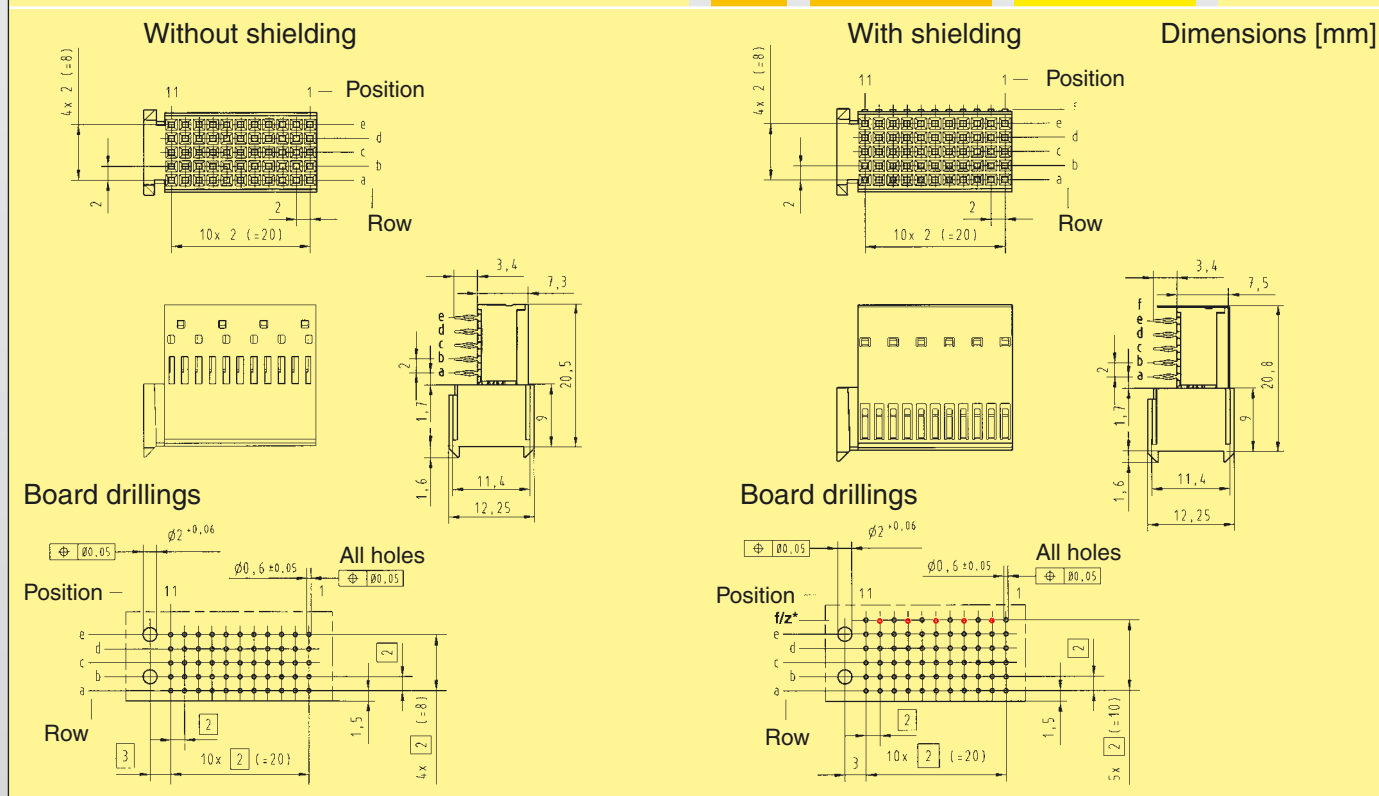




Female connectors, angled

Types with  
5+2 rows

| Identification                        | No. of contacts | Contact length [mm]<br>termination<br>side | Part number                      |  |
|---------------------------------------|-----------------|--------------------------------------------|----------------------------------|--|
| Type C                                | 55              | 3.4                                        | 17 23 055 1101<br>17 23 055 2101 |  |
| Type C,<br>with upper shield          | 55              | 3.4                                        | 17 23 055 1102<br>17 23 055 2102 |  |
| Lower shield<br>for type C connectors |                 |                                            | 17 23 000 4102                   |  |



Types with  
5+2 rows

Types with 8+2 rows

Page

***Straight male connectors***

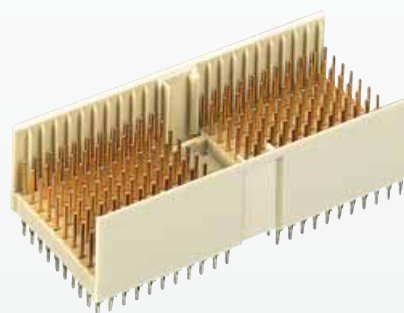
Type D ..... **02.02**

Type E ..... **02.03**

Type DE ..... **02.04**

Types with  
8+2 rows

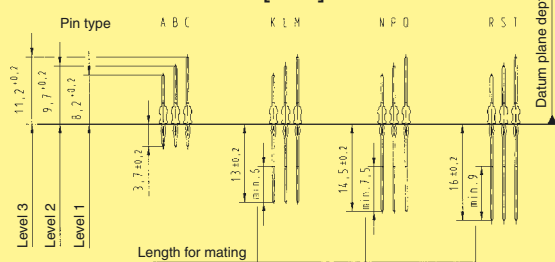




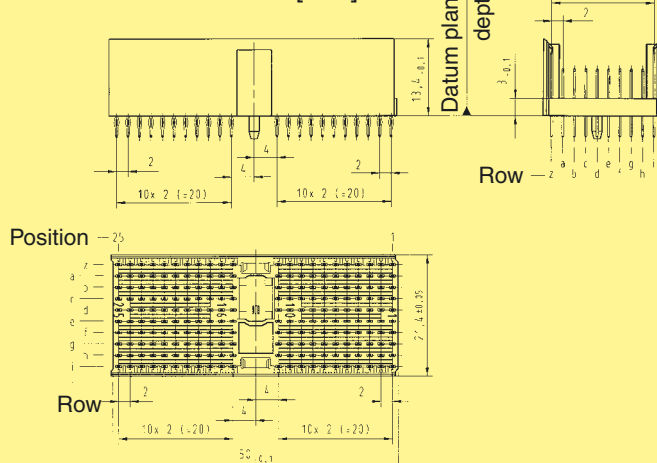
### Male connectors, straight

| Identification | Number of contacts | Contact length [mm]<br>mating side termination side | Part number                      | Contact configuration |
|----------------|--------------------|-----------------------------------------------------|----------------------------------|-----------------------|
| Type D         | 176                | 8.2 3.7                                             | 17 11 176 1201<br>17 11 176 2201 |                       |
| Type D         | 220                | 8.2/<br>11.2 3.7                                    | 17 11 220 1201<br>17 11 220 2201 |                       |
| Type D         | 220                | 9.7/<br>11.2 14.5/<br>16.0                          | 17 11 220 1001<br>17 11 220 2001 |                       |

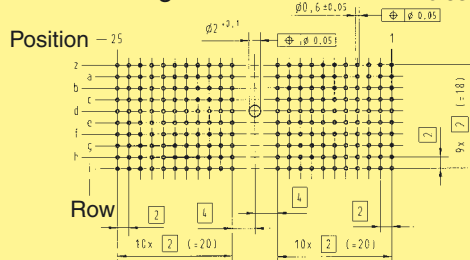
### Contact dimensions [mm]

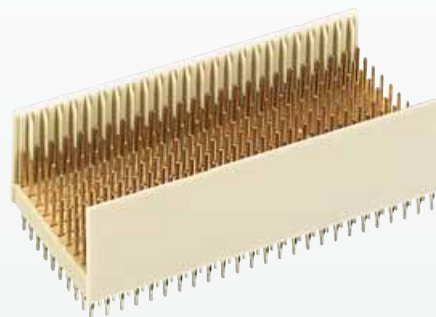


### Connector dimensions [mm]



### Board drillings



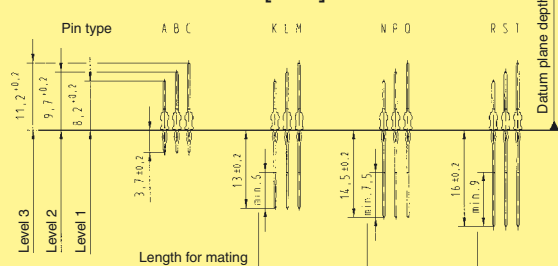


### Male connectors, straight

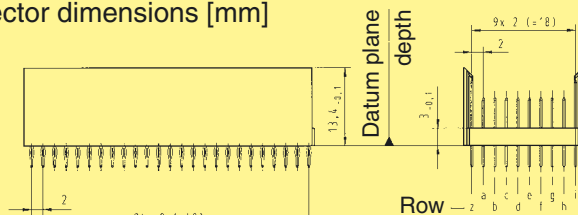
| Identification | Number of contacts | Contact length [mm]<br>mating side<br>termination side | Part number                      | Contact configuration |
|----------------|--------------------|--------------------------------------------------------|----------------------------------|-----------------------|
| Type E         | 200                | 8.2<br>3.7                                             | 17 12 200 1201<br>17 12 200 2201 |                       |
| Type E         | 250                | 8.2/<br>11.2<br>3.7                                    | 17 12 250 1201<br>17 12 250 2201 |                       |
| Type E         | 250                | 9.7/<br>11.2<br>14.5/<br>16.0                          | 17 12 250 1001<br>17 12 250 2001 |                       |

Types with  
8+2 rows

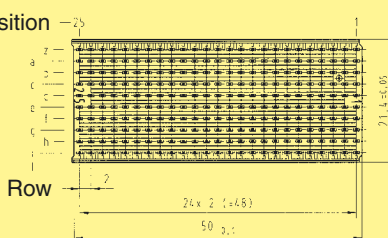
### Contact dimensions [mm]



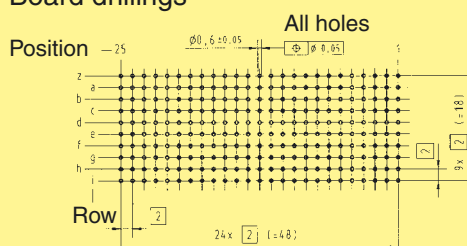
### Connector dimensions [mm]

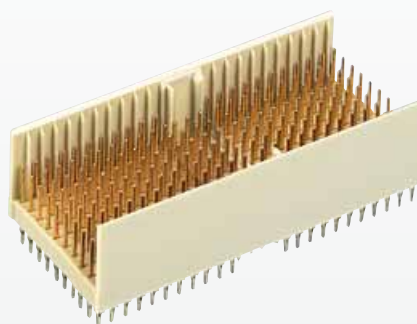


### Position



### Board drillings

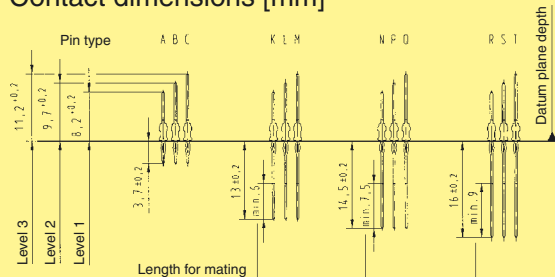




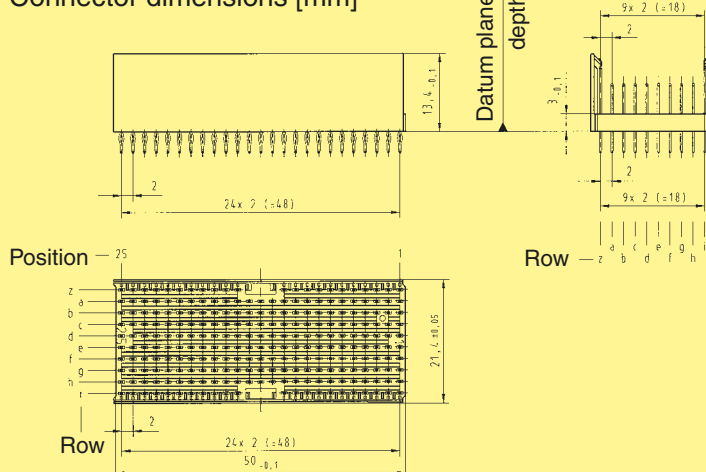
## Male connectors, straight

| Identification | Number of contacts | Contact length [mm]<br>mating side    termination side | Part number                             | Contact configuration |
|----------------|--------------------|--------------------------------------------------------|-----------------------------------------|-----------------------|
| Type DE        | 200                | 8.2      3.7                                           | 17 10 200 1201<br><b>17 10 200 2201</b> |                       |
| Type DE        | 244                | 8.2/<br>11.2      3.7                                  | 17 10 244 1201<br><b>17 10 244 2201</b> |                       |
| Type DE        | 244                | 9.7/<br>11.2      14.5/<br>16.0                        | 17 10 244 1001<br><b>17 10 244 2001</b> |                       |

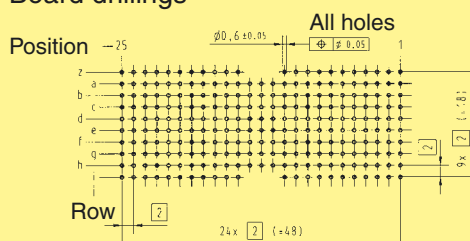
## Contact dimensions [mm]



## Connector dimensions [mm]



## Board drillings



**CompactPCI® configuration**

Page

**CompactPCI® – general information** ..... **03.02**

**CompactPCI® straight male connectors\***

Type A ..... Pos. P1 and P4 ..... **03.04**

Type B ..... Pos. P2, P3 and P5 (incl. AB-friendly) ..... **03.06**

Type AB ..... Pos. RP2, RP3 and RP5 ..... **03.10**

Type Monoblock 47 ..... Pos. P1 + P2 and P4 + P5 ..... **03.12**

**CompactPCI® angled female connectors\***

Type A ..... Pos. J1 and J4 ..... **03.15**

Type B ..... Pos. J2, J3 and J5 ..... **03.16**

Type AB ..... Pos. RJ2, RJ3 and RJ5 ..... **03.17**

Type Monoblock 47 ..... Pos. J1 + J2 and J4 + J5 ..... **03.18**

**Power supply for CompactPCI®**

Type M ..... according to DIN 41 612 ..... **03.19**

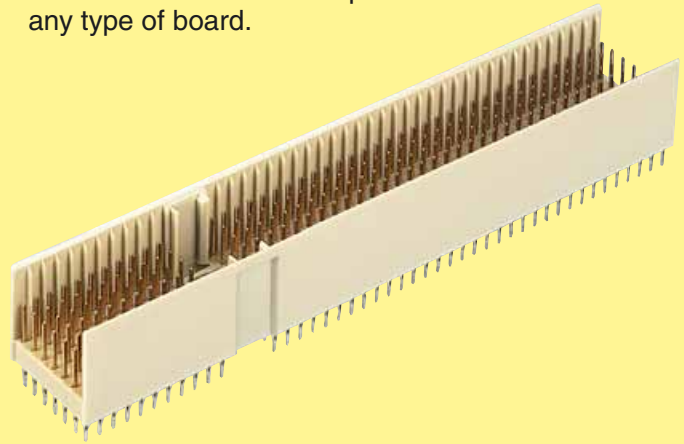


Executive Member

CompactPCI<sup>®</sup> as a standard is maintained and enhanced by the PCI Industrial Computer Manufacturers Group (PICMG<sup>®</sup>). It defines a combination of the electrical and logical specifications of the PCI standard and the mechanical specifications of the IEEE 1101 and IEC 60297 series of standards. The board connector has been developed from the IEC 61076-4-101 series of 2.0 mm connectors. The mounting location and dimensions for the 2.0 mm connectors are specified in IEEE 1101.11. Some additional mechanical definitions for 2.0 mm connectors in the Eurocard format are being specified in the VITA 30 draft.

Other international standards are listed in the CompactPCI<sup>®</sup> standard for environmental and

J1/P1 and J2/P2 as a minimum. Backplanes should always have the full complement of connectors to be compatible with any type of board.



Connectors, as well as contact numbers on the connectors are numbered from bottom to top. This is opposite to numbering schemes in other architectures.

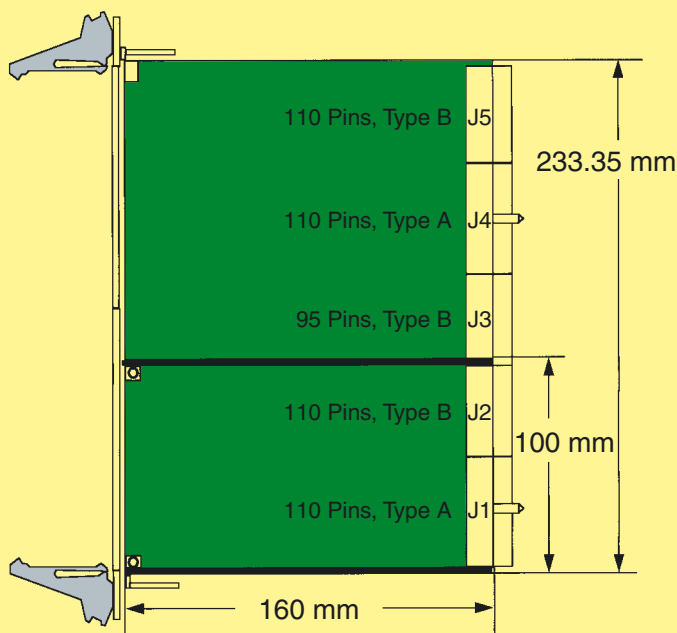
The front panel of CPCI cards may be equipped with additional keying pegs to code individual board types. There is also an extended pin length to remove any electro-static charge before contacts on the rear connectors mate. This pin also functions as a mechanical guide to position the board as straight as possible for insertion. This prevents pin bending and lowers the insertion force. Some applications could require up to 500 pins to be pushed into sockets, all at the same time.

Connectors for high availability applications (hot swap) come with 3 different lengths of pins for a staged sequence of mate or break of contact.

Connector J1/P1 carries the signals for a 32 bit PCI bus (see table of contact assignments for J1/P1). Connector J2/P2 on a system card has the additional signals for a 64 bit PCI bus and some user defined I/O (see table of contact assignments for J2/P2). On slave cards all of J2/P2 might be user defined I/O except the top row which carries the signals for geographical addressing. J3 should be reserved for other system bus definitions. J4/P4 and J5/P5 are used for I/O or secondary buses, e.g. H.110 in telecom applications or for bridges into other buses like VMEbus. This is used to accommodate two bus platforms in one card cage, on one backplane.

related specifications. This gives CompactPCI<sup>®</sup> a solid foundation of international standards and practices for mechanical robustness.

The board format is either a 3U or a 6U Eurocard as defined in IEC 60297. There are two or five connectors specified for 3U or 6U boards respectively. Connectors are numbered from J1/P1 through J5/P5 (bottom to top) on the board or backplane. Slave or peripheral boards need J1/P1 as a minimum, master or system boards need both



Contact assignment on CompactPCI<sup>®</sup> system position (J1/P1)

|    | a            | b            | c      | d      | e        |    |
|----|--------------|--------------|--------|--------|----------|----|
| 25 | +5 V         | REQ64#       | ENUM#  | +3,3 V | +5 V     | 25 |
| 24 | AD[1]        | +5 V         | V(I/O) | AD[0]  | ACK64#   | 24 |
| 23 | +3,3 V       | AD[4]        | AD[3]  | +5 V   | AD[2]    | 23 |
| 22 | AD[7]        | GND          | +3,3 V | AD[6]  | AD[5]    | 22 |
| 21 | +3,3 V       | AD[9]        | AD[8]  | M66EN  | C/BE[0]# | 21 |
| 20 | AD[12]       | GND          | V(I/O) | AD[11] | AD[10]   | 20 |
| 19 | +3,3 V       | AD[15]       | AD[14] | GND    | AD[13]   | 19 |
| 18 | SERR#        | GND          | +3,3 V | PAR    | C/BE[1]# | 18 |
| 17 | +3,3 V       | SDONE        | SBO#   | GND    | PERR#    | 17 |
| 16 | DEVSEL#      | GND          | V(I/O) | STOP#  | LOCK#    | 16 |
| 15 | +3,3 V       | FRAME#       | IRDY#  | GND    | TRDY#    | 15 |
| 14 |              |              |        |        |          | 14 |
| 13 | Key Area     |              |        |        |          | 13 |
| 12 |              |              |        |        |          | 12 |
| 11 | AD[18]       | AD[17]       | AD[16] | GND    | C/BE[2]# | 11 |
| 10 | AD[21]       | GND          | +3,3 V | AD[20] | AD[19]   | 10 |
| 9  | C/BE[3]#     | IDSEL        | AD[23] | GND    | AD[22]   | 9  |
| 8  | AD[26]       | GND          | V(I/O) | AD[25] | AD[24]   | 8  |
| 7  | AD[30]       | AD[29]       | AD[28] | GND    | AD[27]   | 7  |
| 6  | REQ#         | GND          | +3,3 V | CLK    | AD[31]   | 6  |
| 5  | Bus Reserved | Bus Reserved | RST#   | GND    | GNT#     | 5  |
| 4  | Bus Reserved | GND          | V(I/O) | INTP   | INTS     | 4  |
| 3  | INTA#        | INTB#        | INTC#  | +5 V   | INTD#    | 3  |
| 2  | TCK          | +5 V         | TMS    | TDO    | TDI      | 2  |
| 1  | +5 V         | -12 V        | TRST#  | +12 V  | +5 V     | 1  |
|    | a            | b            | c      | d      | e        |    |

In mechanical terms J1/P1 is a 25x5 matrix of contacts. Three rows of 5 contacts (rows 12 - 15) are not used for electrical contacts. Instead, plastic keys of different orientation and configuration are used to key board locations as to system or peripheral slot, voltage options, etc.

J2/P2 is a shortened connector with only 22 rows of contacts instead of 25 rows for a standard size. HARTING now offers monolithic versions with J1/P1 and J2/P2 combined in one single connector. This combination together with some space left on the card to fit into guide rails makes maximum use of the 100 mm rear edge of the 3U Eurocard. On a 6U card this connector setup is repeated on J4/P4 and J5/P5.

The J3/P3 connector is a shortened version of the 2.0 mm connector with 19 rows of 5 signal contacts.

The size results from the height of a 6U board (233 mm) which is more than double the height of a 3U board.

Contact assignment on CompactPCI<sup>®</sup> system position (J2/P2)

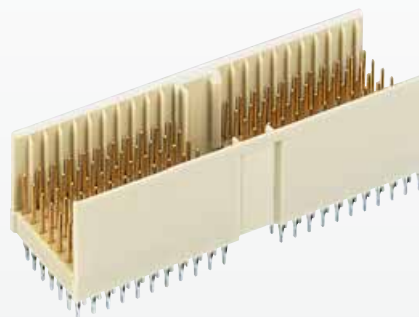
|    | a            | b            | c            | d        | e            |    |
|----|--------------|--------------|--------------|----------|--------------|----|
| 22 | GA4          | GA3          | GA2          | GA1      | GA0          | 22 |
| 21 | CLK6         | GND          | Reserved     | Reserved | Reserved     | 21 |
| 20 | CLK5         | GND          | Reserved     | GND      | Reserved     | 20 |
| 19 | GND          | GND          | Reserved     | Reserved | Reserved     | 19 |
| 18 | Bus Reserved | Bus Reserved | Bus Reserved | GND      | Bus Reserved | 18 |
| 17 | Bus Reserved | GND          | PRST#        | REQ6#    | GNT6#        | 17 |
| 16 | Bus Reserved | Bus Reserved | DEG#         | GND      | Bus Reserved | 16 |
| 15 | Bus Reserved | GND          | FAL#         | REQ5#    | GNT5#        | 15 |
| 14 | AD[35]       | AD[34]       | AD[33]       | GND      | AD[32]       | 14 |
| 13 | AD[38]       | GND          | V(I/O)       | AD[37]   | AD[36]       | 13 |
| 12 | AD[42]       | AD[41]       | AD[40]       | GND      | AD[39]       | 12 |
| 11 | AD[45]       | GND          | V(I/O)       | AD[44]   | AD[43]       | 11 |
| 10 | AD[49]       | AD[48]       | AD[47]       | GND      | AD[46]       | 10 |
| 9  | AD[52]       | GND          | V(I/O)       | AD[51]   | AD[50]       | 9  |
| 8  | AD[56]       | AD[55]       | AD[54]       | GND      | AD[53]       | 8  |
| 7  | AD[59]       | GND          | V(I/O)       | AD[58]   | AD[57]       | 7  |
| 6  | AD[63]       | AD[62]       | AD[61]       | GND      | AD[60]       | 6  |
| 5  | C/BE[5]#     | GND          | V(I/O)       | C/BE[4]# | PAR64        | 5  |
| 4  | V(I/O)       | Bus Reserved | C/BE[7]#     | GND      | C/BE[6]#     | 4  |
| 3  | CLK4         | GND          | GNT3#        | REQ4#    | GNT4#        | 3  |
| 2  | CLK2         | CLK3         | SYSEN#       | GNT2#    | REQ3#        | 2  |
| 1  | CLK1         | GND          | REQ1#        | GNT1#    | REQ2#        | 1  |
|    | a            | b            | c            | d        | e            |    |

All connectors used for CompactPCI<sup>®</sup> are based on a 7 column pitch. The inner 5 columns are used for logic signals and power. The outer columns on either side are reserved for shielding or ground.



Executive Member

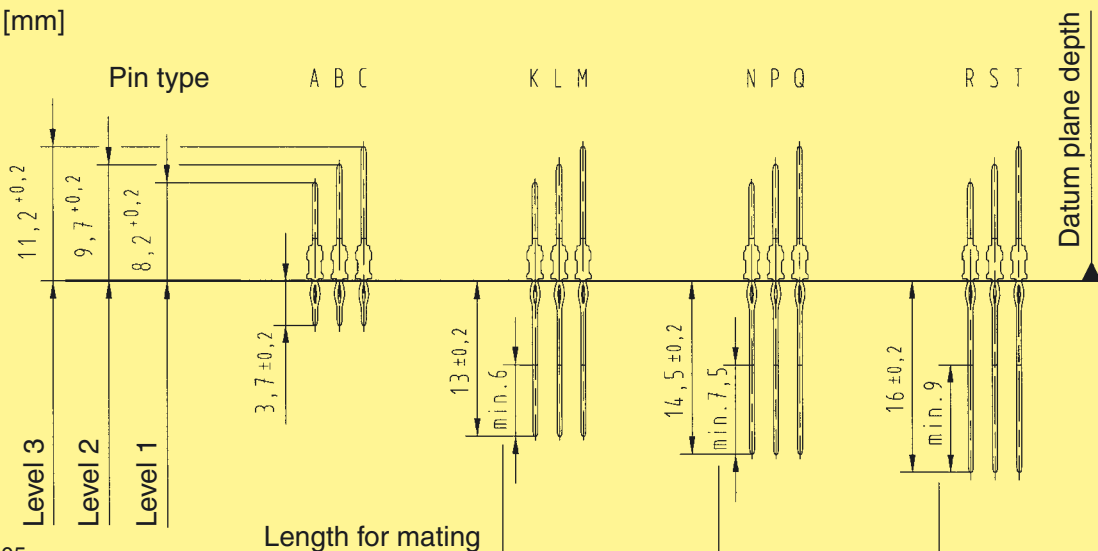




## Male connectors, straight

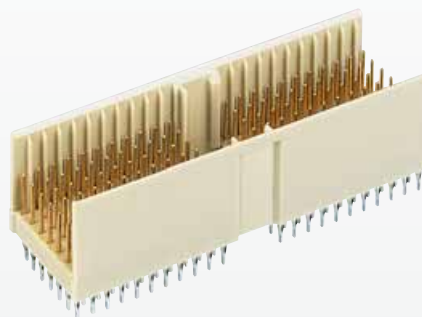
| Identification                               | Number of contacts | Contact length [mm]<br>mating side termination side | Part number                                                    | Contact configuration |
|----------------------------------------------|--------------------|-----------------------------------------------------|----------------------------------------------------------------|-----------------------|
| Type A, CompactPCI<br>(Position P1)          | 154                | 8.2/<br>9.7/<br>11.2                                | 3.7<br><br><br><b>17 01 154 1203</b><br><b>17 01 154 2203</b>  |                       |
| Type A, CompactPCI<br>(Position P4)          | 154                | 9.7/<br>11.2                                        | 16.0<br><br><br><b>17 01 154 1604</b><br><b>17 01 154 2604</b> |                       |
| Type A, CompactPCI<br>(Position P4)          | 154                | 8.2/<br>9.7/<br>11.2                                | 16.0<br><br><br><b>17 01 154 1603</b><br><b>17 01 154 2603</b> |                       |
| Type A, CompactPCI hot swap<br>(Position P1) | 154                | 8.2/<br>9.7/<br>11.2                                | 3.7<br><br><br><b>17 01 154 1204</b><br><b>17 01 154 2204</b>  |                       |

## Contact dimensions [mm]



Connector dimensions see page 03.05

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

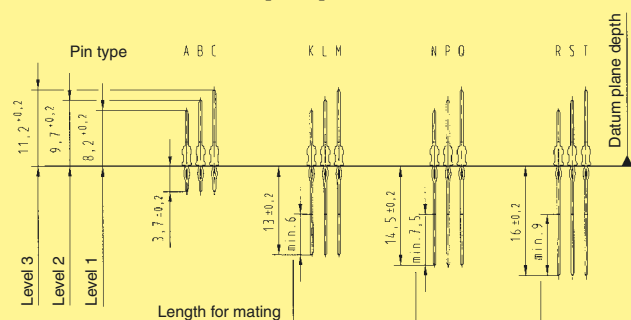


### Male connectors, straight

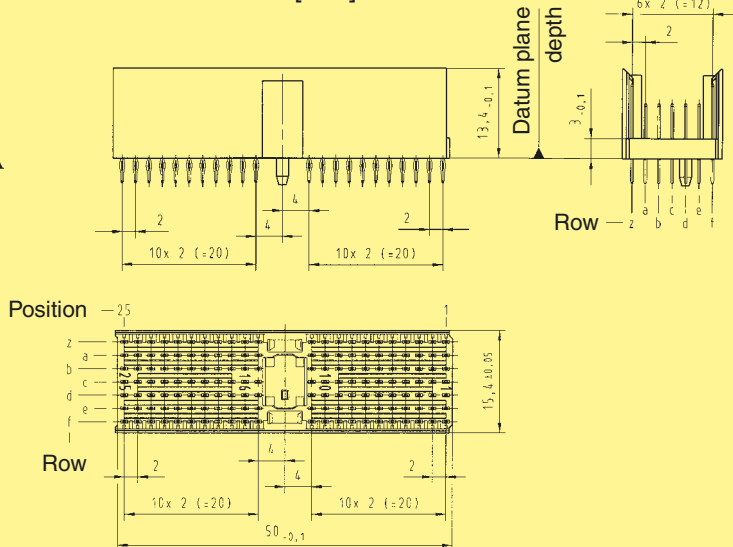
| Identification                                                  | Number of contacts | Contact length [mm]<br>mating side<br>termination side | Part number                             | Contact configuration |
|-----------------------------------------------------------------|--------------------|--------------------------------------------------------|-----------------------------------------|-----------------------|
| Type A,<br>CompactPCI<br>computer<br>telephony<br>(Position P4) | 100                | 8.2/<br>9.7/<br>11.2                                   | 17 01 100 1001<br><b>17 01 100 2001</b> |                       |
| Type A,<br>CompactPCI<br>computer<br>telephony<br>(Position P4) | 100                | 8.2/<br>9.7/<br>11.2                                   | 17 01 100 1201<br><b>17 01 100 2201</b> |                       |

CompactPCI

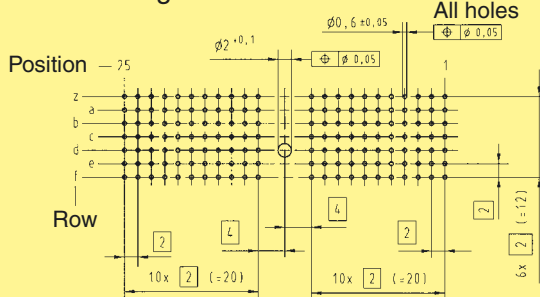
### Contact dimensions [mm]



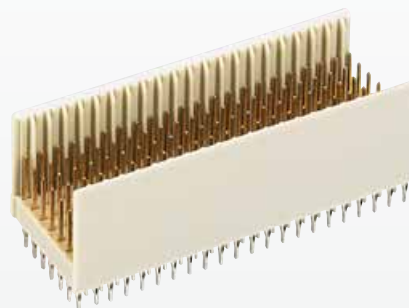
### Connector dimensions [mm]



### Board drillings



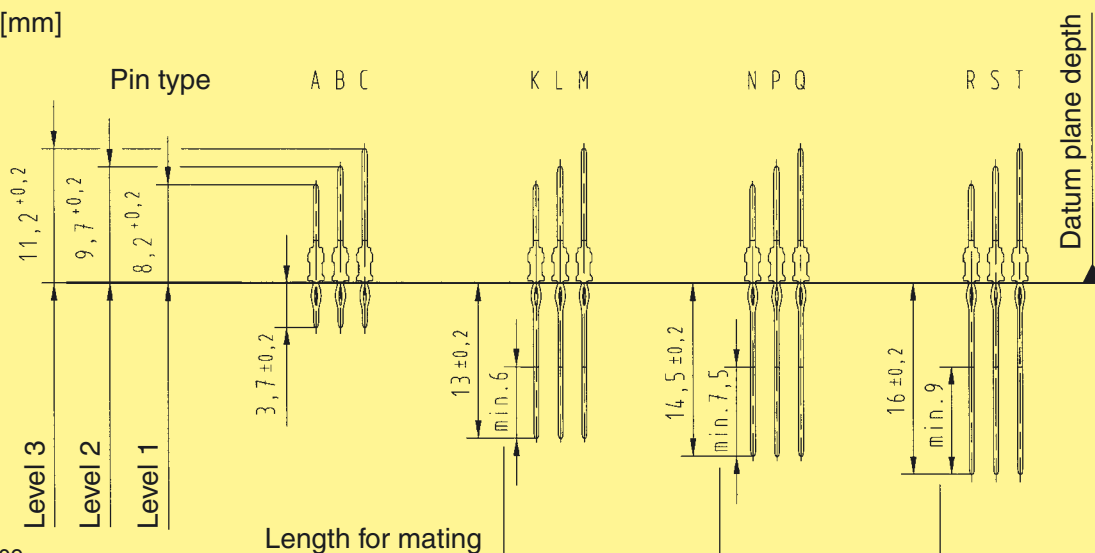




## Male connectors, straight

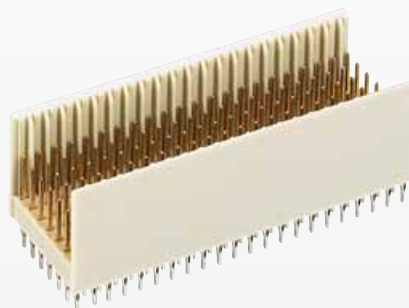
| Identification                          | Number of contacts | Contact length [mm]<br>mating side termination side | Part number                             | Contact configuration |
|-----------------------------------------|--------------------|-----------------------------------------------------|-----------------------------------------|-----------------------|
| Type B, CompactPCI<br><br>(Position P2) | 154                | 9.7/<br>11.2                                        | 17 04 154 1203<br><b>17 04 154 2203</b> |                       |
| Type B, CompactPCI computer telephony   | 132                | 8.2/<br>9.7/<br>11.2                                | 17 04 132 1001<br><b>17 04 132 2001</b> |                       |
| Type B, CompactPCI computer telephony   | 154                | 8.2/<br>9.7/<br>11.2                                | 17 04 154 1204<br><b>17 04 154 2204</b> |                       |
| Type B, CompactPCI computer telephony   | 132                | 8.2/<br>9.7/<br>11.2                                | 17 04 132 1201<br><b>17 04 132 2201</b> |                       |

## Contact dimensions [mm]



Connector dimensions see page 03.09

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

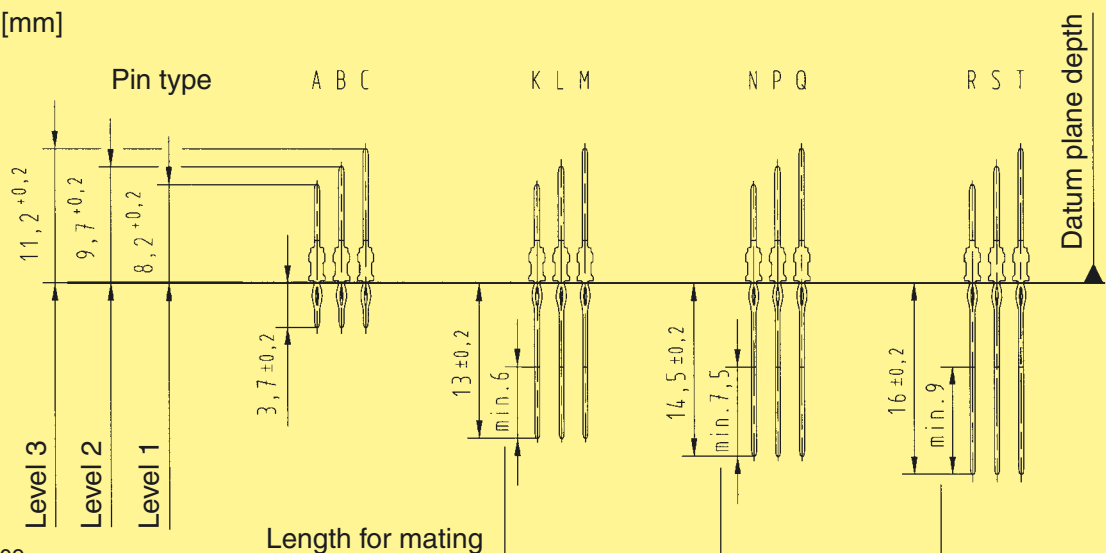


Male connectors, straight

| Identification                                | Number of contacts | Contact length [mm]<br>mating side termination side | Part number                                                                 | Contact configuration |
|-----------------------------------------------|--------------------|-----------------------------------------------------|-----------------------------------------------------------------------------|-----------------------|
| Type B,<br>CompactPCI<br>I/O<br>(Position P5) | 154                | 9.7/<br>11.2                                        | 16.0<br><br><b>17 04 154 1601</b><br><b>17 04 154 2601</b>                  |                       |
| Type B,<br>CompactPCI<br>AB friendly          | 154                | 9.7/<br>11.2                                        | 3.7/<br>16.0<br><br><b>17 04 154 1010</b><br><b>17 04 154 2010</b>          |                       |
| Type B,<br>CompactPCI<br>AB friendly          | 154                | 9.7/<br>11.2                                        | 3.7/<br>14.5/<br>16.0<br><br><b>17 04 154 1002</b><br><b>17 04 154 2002</b> |                       |
| Type B,<br>CompactPCI<br>AB friendly          | 154                | 8.2/<br>11.2                                        | 3.7/<br>16.0<br><br><b>17 04 154 1006</b><br><b>17 04 154 2006</b>          |                       |

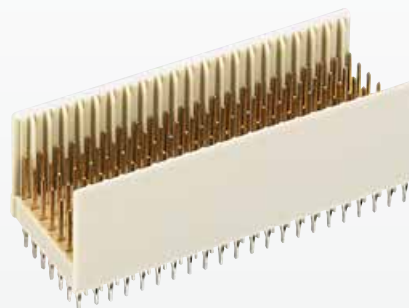
CompactPCI

Contact dimensions [mm]



Connector dimensions see page 03.09

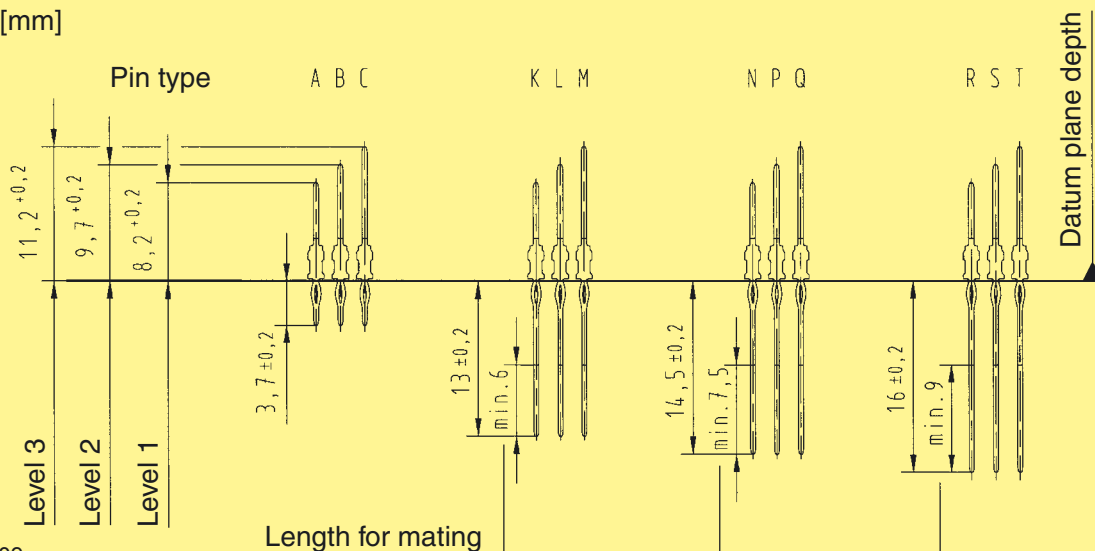
Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**



## Male connectors, straight

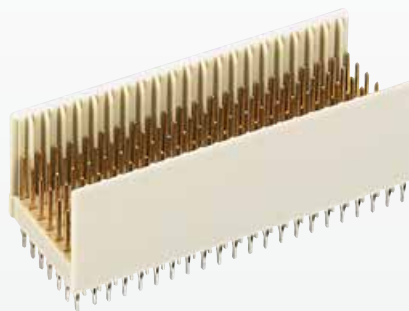
| Identification                                  | Number of contacts | Contact length [mm] |                       | Part number                             | Contact configuration |
|-------------------------------------------------|--------------------|---------------------|-----------------------|-----------------------------------------|-----------------------|
|                                                 |                    | mating side         | termination side      |                                         |                       |
| Type B, Compact PCI<br>(Position P3)            | 133                | 9.7/<br>11.2        | 16.0                  | 17 05 133 1603<br><b>17 05 133 2603</b> |                       |
| Type B, CompactPCI AB friendly<br>(Position P3) | 133                | 9.7/<br>11.2        | 3.7/<br>16.0          | 17 05 133 1005<br><b>17 05 133 2005</b> |                       |
| Type B, CompactPCI AB friendly                  | 133                | 9.7/<br>11.2        | 3.7/<br>14.5/<br>16.0 | 17 05 133 1004<br><b>17 05 133 2004</b> |                       |
| Type B, CompactPCI AB friendly                  | 133                | 8.2/<br>11.2        | 3.7/<br>16.0          | 17 05 133 1002<br><b>17 05 133 2002</b> |                       |

## Contact dimensions [mm]



Connector dimensions see page 03.09

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

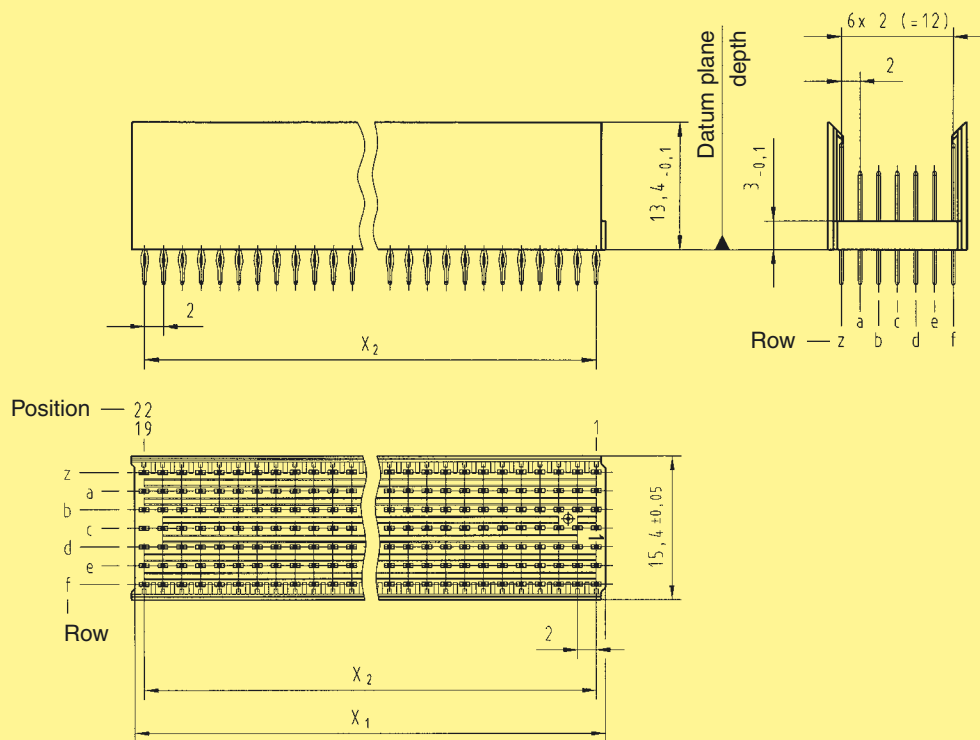


## Male connectors, straight

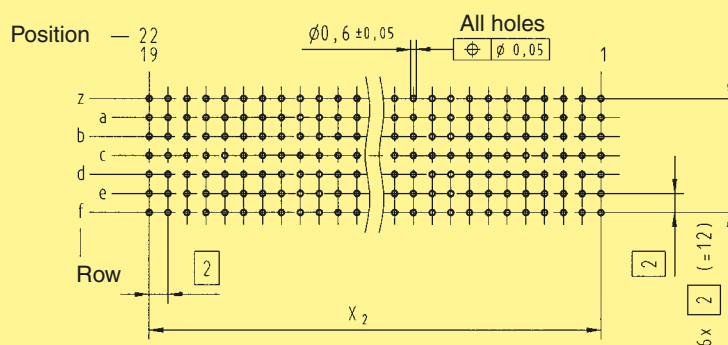
Drawing

Dimensions in mm

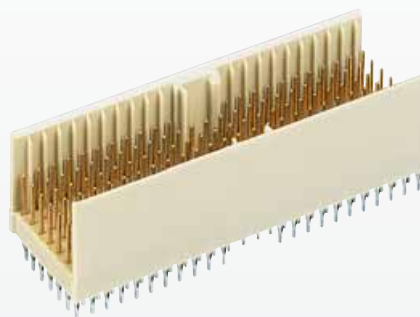
Connector dimensions [mm]



## Board drillings



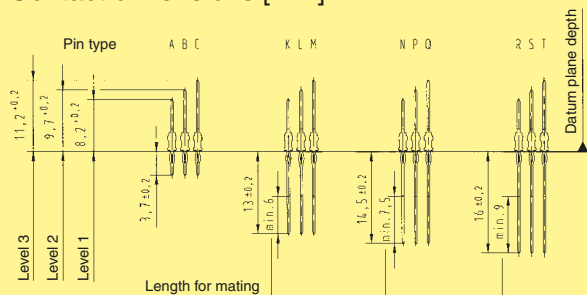
| Contact positions | $x_1$ | $x_2$                |
|-------------------|-------|----------------------|
| 19                | 37.9  | $18 \times 2 (= 36)$ |
| 22                | 43.9  | $21 \times 2 (= 42)$ |



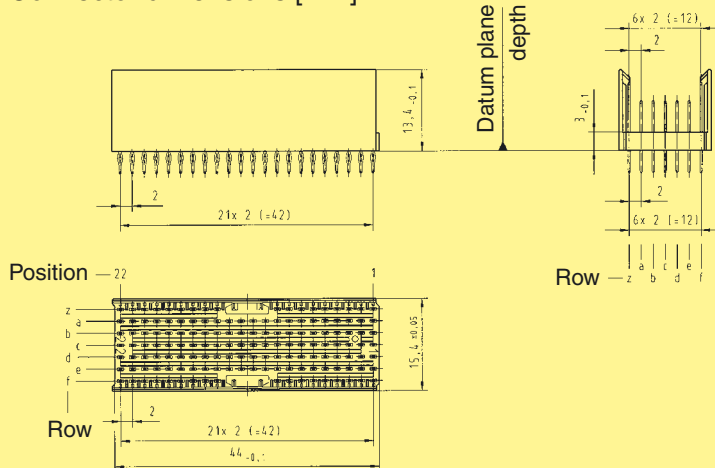
## Male connectors, straight

| Identification | Number of contacts | Contact length [mm]<br>mating side termination side | Part number                      | Contact configuration |
|----------------|--------------------|-----------------------------------------------------|----------------------------------|-----------------------|
| Type AB        | 110                | 8.2 3.7                                             | 17 14 110 1201<br>17 14 110 2201 |                       |
| Type AB        | 146                | 8.2/<br>11.2 3.7                                    | 17 14 146 1201<br>17 14 146 2201 |                       |
| Type AB        | 146                | 9.7/<br>11.2 3.7                                    | 17 14 146 1202<br>17 14 146 2202 |                       |
| Type AB        | 146                | 9.7/<br>11.2 16.0                                   | 17 14 146 1601<br>17 14 146 2601 |                       |

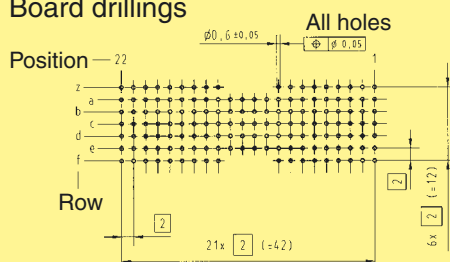
## Contact dimensions [mm]



## Connector dimensions [mm]



## Board drillings



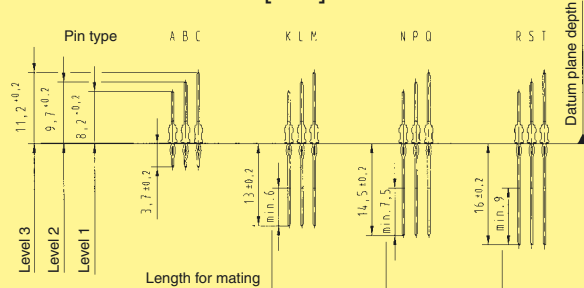


## Male connectors, straight

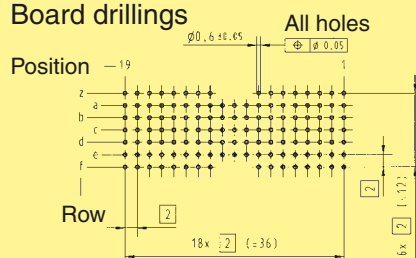
| Identification | Number of contacts | Contact length [mm]<br>mating side | termination side | Part number                             | Contact configuration |
|----------------|--------------------|------------------------------------|------------------|-----------------------------------------|-----------------------|
| Type AB        | 95                 | 8.2                                | 3.7              | 17 13 095 1201<br><b>17 13 095 2201</b> |                       |
| Type AB        | 127                | 8.2/<br>11.2                       | 3.7              | 17 13 127 1201<br><b>17 13 127 2201</b> |                       |
| Type AB        | 127                | 9.7/<br>11.2                       | 3.7              | 17 13 127 1202<br><b>17 13 127 2202</b> |                       |
| Type AB        | 127                | 9.7/<br>11.2                       | 16.0             | 17 13 127 1602<br><b>17 13 127 2602</b> |                       |

## CompactPCI

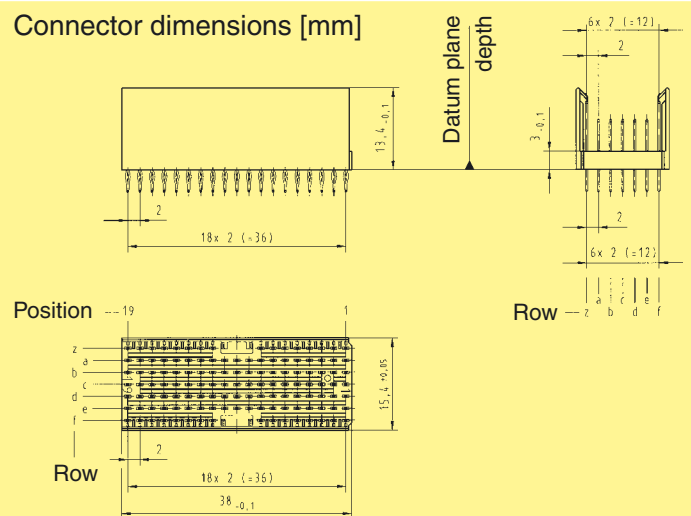
Contact dimensions [mm]



## Board drillings



### Connector dimensions [mm]

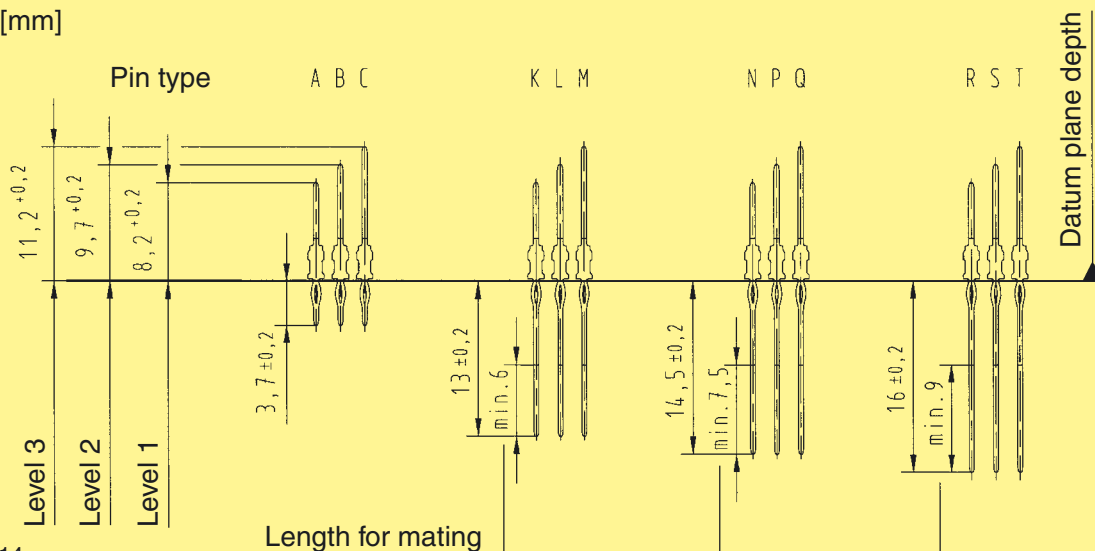




## Male connectors, straight

| Identification    | Number of contacts | Contact length [mm]<br>mating side termination side | Part number                      | Contact configuration |
|-------------------|--------------------|-----------------------------------------------------|----------------------------------|-----------------------|
| Type Monoblock 47 | 220                | 8.2 3.7                                             | 17 06 220 1201<br>17 06 220 2201 |                       |
| Type Monoblock 47 | 308                | 8.2/<br>11.2 3.7                                    | 17 06 308 1201<br>17 06 308 2201 |                       |
| Type Monoblock 47 | 220                | 9.7 3.7                                             | 17 06 220 1202<br>17 06 220 2202 |                       |
| Type Monoblock 47 | 308                | 9.7/<br>11.2 3.7                                    | 17 06 308 1204<br>17 06 308 2204 |                       |

## Contact dimensions [mm]



Connector dimensions see page 03.14

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

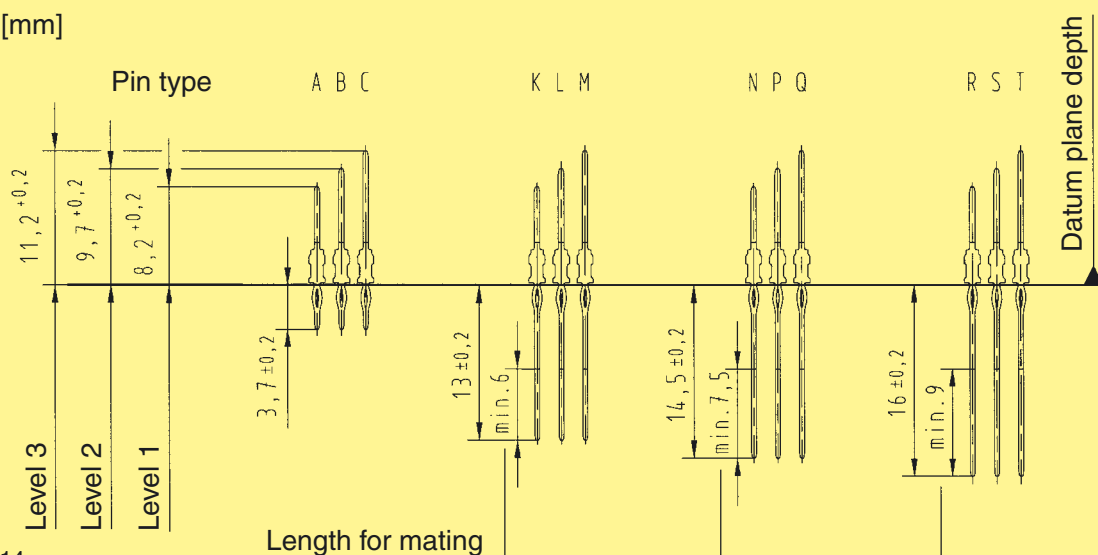




## Male connectors, straight

| Identification                                         | Number of contacts | Contact mating side  | Contact length [mm] termination side | Part number                             | Contact configuration |
|--------------------------------------------------------|--------------------|----------------------|--------------------------------------|-----------------------------------------|-----------------------|
| Type Monoblock 47, CompactPCI<br>(Positions P1 and P2) | 308                | 8.2/<br>9.7/<br>11.2 | 3.7                                  | 17 06 308 1202<br><b>17 06 308 2202</b> |                       |
| Type Monoblock 47, CompactPCI hot swap                 | 308                | 8.2/<br>9.7/<br>11.2 | 3.7                                  | 17 06 308 1203<br><b>17 06 308 2203</b> |                       |
| Type Monoblock 47, CompactPCI computer telephony       | 232                | 8.2/<br>9.7/<br>11.2 | 3.7                                  | 17 06 232 1201<br><b>17 06 232 2201</b> |                       |
| Type Monoblock 47, CompactPCI I/O                      | 308                | 8.2/<br>9.7/<br>11.2 | 3.7/<br>16.0                         | 17 06 308 1001<br><b>17 06 308 2001</b> |                       |

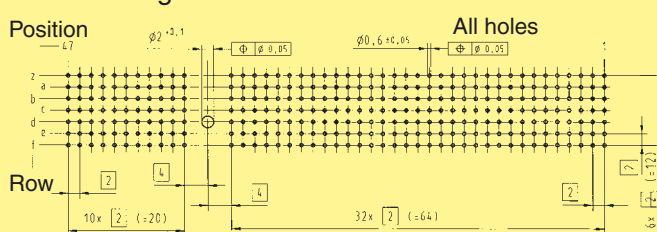
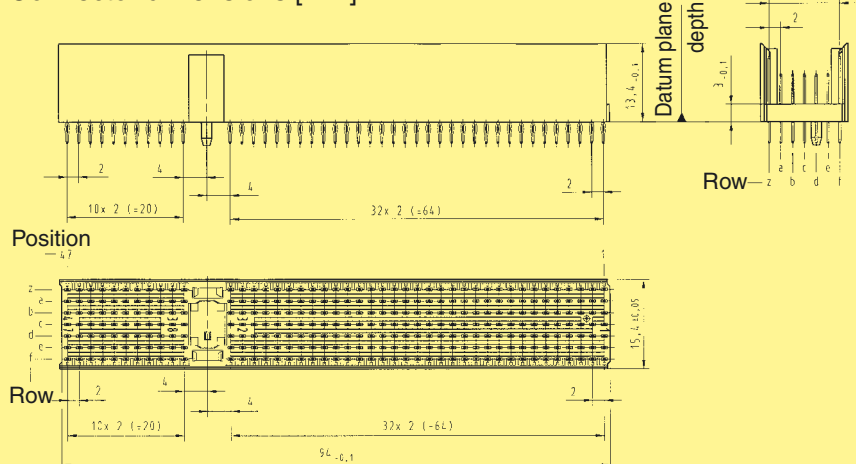
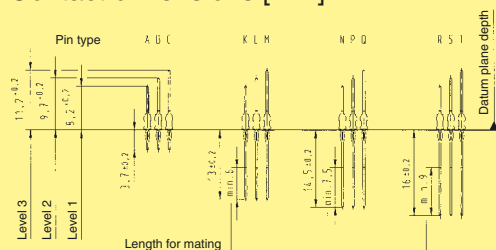
## Contact dimensions [mm]

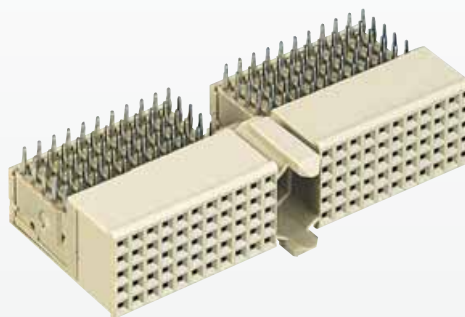


Connector  
dimensions see page 03.14

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**



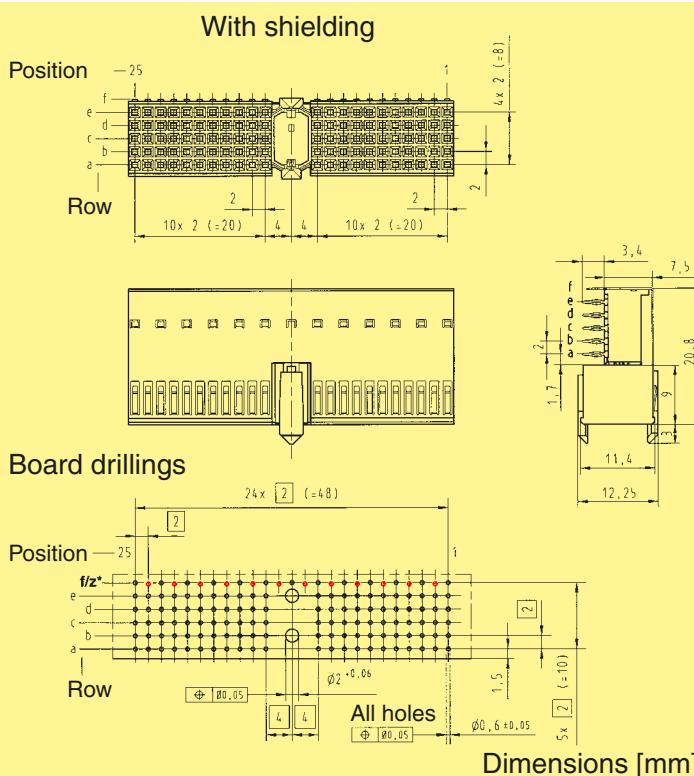
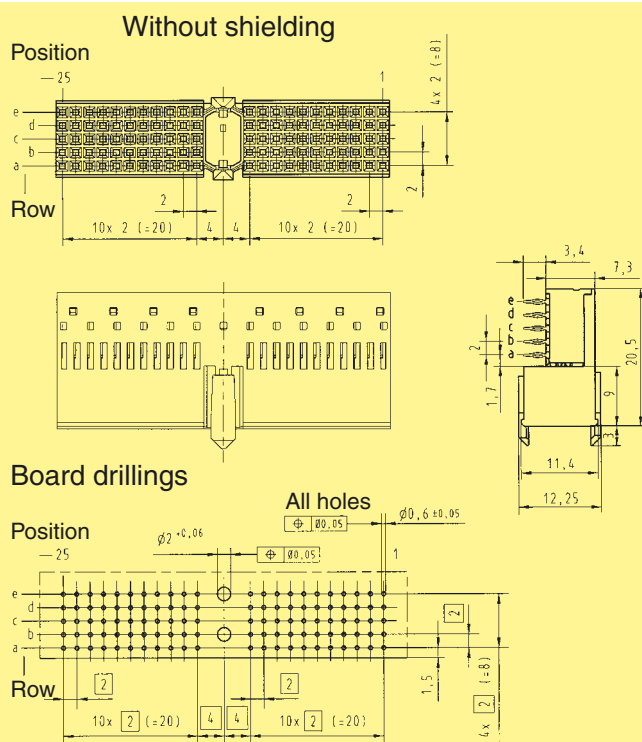
[illegible]



## Female connectors, angled

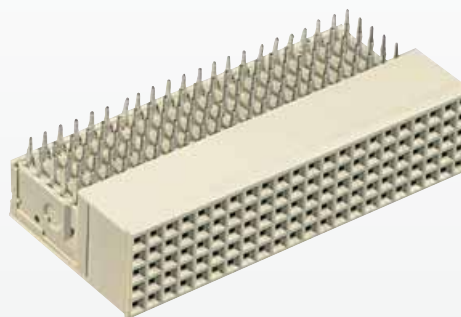
| Identification                                                                         | No. of contacts | Contact length [mm]<br>termination side | Part number                             |  |
|----------------------------------------------------------------------------------------|-----------------|-----------------------------------------|-----------------------------------------|--|
| Type A                                                                                 | 110             | 3.4                                     | 17 21 110 1101<br><b>17 21 110 2101</b> |  |
| Type A,<br>with upper shield<br>CompactPCI (Positions J1, J4)                          | 110             | 3.4                                     | 17 21 110 1102<br><b>17 21 110 2102</b> |  |
| Lower shield<br>for type A connectors                                                  |                 |                                         | 17 21 000 4102                          |  |
| Type A,<br>with split upper shield<br>CompactPCI computer telephony (Position J4)      | 90              | 3.4                                     | 17 21 090 1103<br><b>17 21 090 2103</b> |  |
| Lower shield<br>for type A connectors (rows 1 – 5),<br>CompactPCI computer telephony   |                 |                                         | 17 29 000 4102                          |  |
| Lower shield<br>for type A connectors (rows 15 – 25),<br>CompactPCI computer telephony |                 |                                         | 17 23 000 4102                          |  |

## CompactPCI



Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

\* hole on even contact numbers  
only needed for lower shielding



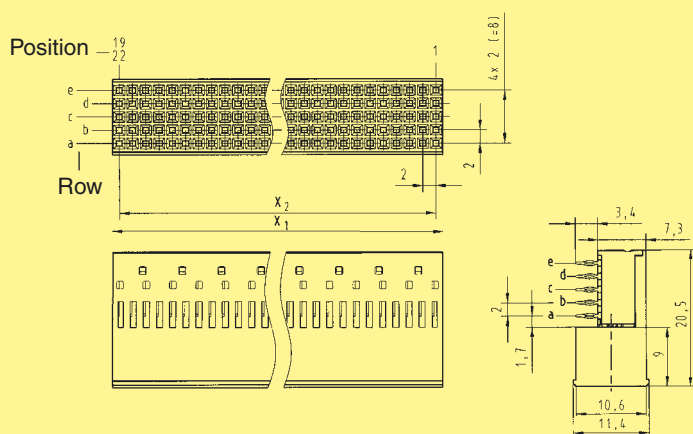
## Female connectors, angled

| Identification                                          | No. of contacts | Contact length [mm]<br>termination<br>side | Part number                             |  |
|---------------------------------------------------------|-----------------|--------------------------------------------|-----------------------------------------|--|
| Type B                                                  | 95              | 3.4                                        | 17 25 095 1101<br><b>17 25 095 2101</b> |  |
| Type B, with upper shield<br>CompactPCI (Position J3)   | 95              | 3.4                                        | 17 25 095 1102<br><b>17 25 095 2102</b> |  |
| Lower shield<br>for type B connectors with 95 contacts  |                 |                                            | 17 25 000 4102                          |  |
| Type B,<br>CompactPCI                                   | 110             | 3.4                                        | 17 24 110 1101<br><b>17 24 110 2101</b> |  |
| Type B,<br>with upper shield (Positions J2, J5)         | 110             | 3.4                                        | 17 24 110 1102<br><b>17 24 110 2102</b> |  |
| Lower shield<br>for type B connectors with 110 contacts |                 |                                            | 17 24 000 4102                          |  |

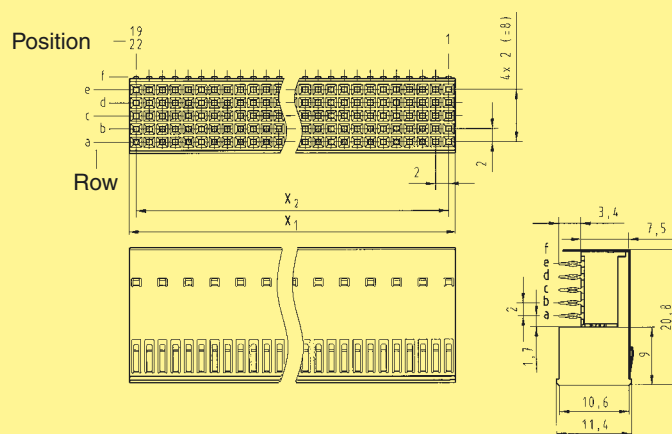
| Contact positions | X <sub>1</sub> | X <sub>2</sub>       |
|-------------------|----------------|----------------------|
| 19                | 37.9           | 18 x <b>2</b> (= 36) |
| 22                | 43.9           | 21 x <b>2</b> (= 42) |

Dimensions [mm]

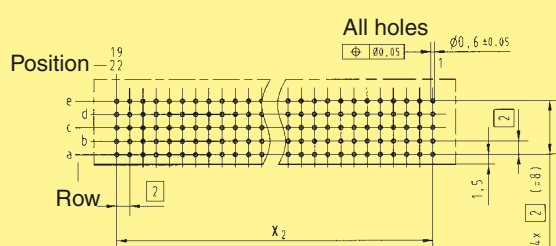
## Without shielding



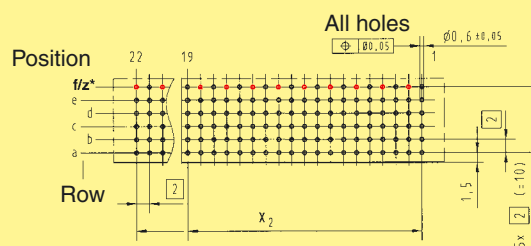
## With shielding

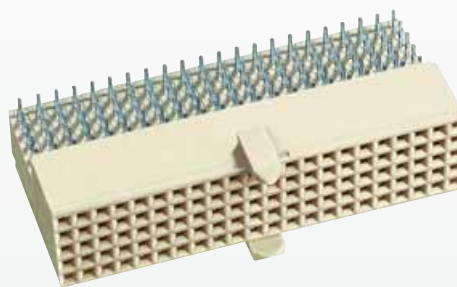


## Board drillings



## Board drillings





### Female connectors, angled

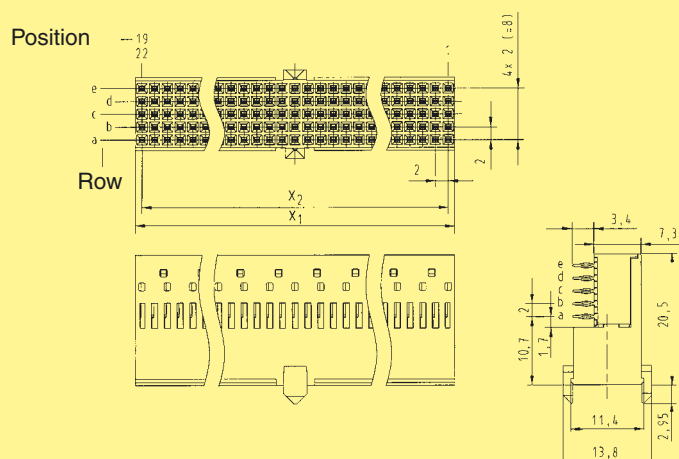
| Identification                                           | No. of contacts | Contact length [mm]<br>termination<br>side | Part number                             |  |
|----------------------------------------------------------|-----------------|--------------------------------------------|-----------------------------------------|--|
| Type AB                                                  | 95              | 3.4                                        | 17 33 095 1101<br><b>17 33 095 2101</b> |  |
| Type AB,<br>with upper shield<br>(Position RJ3)          | 95              | 3.4                                        | 17 33 095 1102<br><b>17 33 095 2102</b> |  |
| Lower shield<br>for type AB connectors with 95 contacts  |                 |                                            | 17 33 000 4102                          |  |
| Type AB                                                  | 110             | 3.4                                        | 17 34 110 1101<br><b>17 34 110 2101</b> |  |
| Type AB,<br>with upper shield<br>(Positions RJ2, RJ5)    | 110             | 3.4                                        | 17 34 110 1102<br><b>17 34 110 2102</b> |  |
| Lower shield<br>for type AB connectors with 110 contacts |                 |                                            | 17 34 000 4102                          |  |

CompactPCI

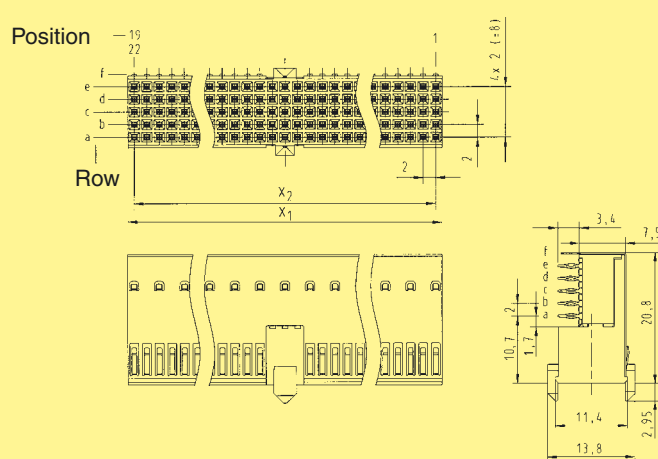
| Contact positions | X <sub>1</sub> | X <sub>2</sub>       |
|-------------------|----------------|----------------------|
| 19                | 37.9           | 18 x <b>2</b> (= 36) |
| 22                | 43.9           | 21 x <b>2</b> (= 42) |

Dimensions [mm]

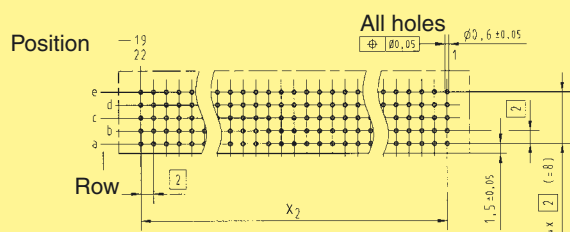
#### Without shielding



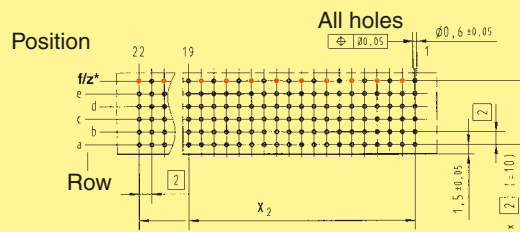
#### With shielding

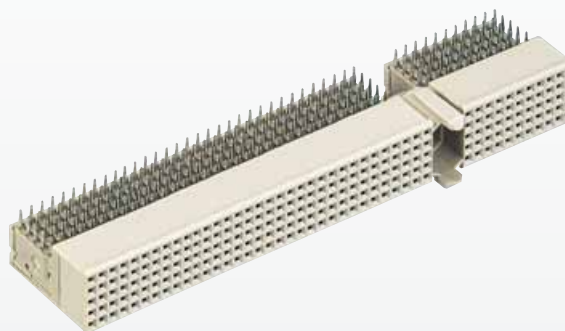


#### Board drillings



#### Board drillings

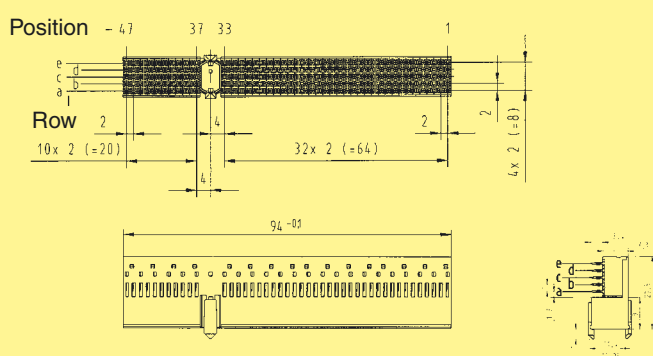




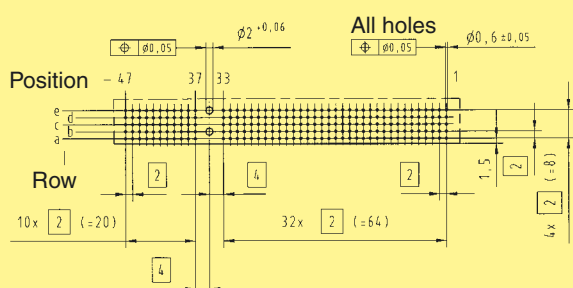
## Female connectors, angled

| Identification                                                                                    | No. of contacts | Contact length [mm]<br>termination<br>side | Part number                             |  |
|---------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-----------------------------------------|--|
| Type Monoblock 47                                                                                 | 220             | 3.4                                        | 17 26 220 1101<br><b>17 26 220 2101</b> |  |
| Type Monoblock 47,<br>with upper shield                                                           | 220             | 3.4                                        | 17 26 220 1102<br><b>17 26 220 2102</b> |  |
| Type Monoblock 47,<br>with upper shield,<br>CompactPCI computer telephony                         | 200             | 3.4                                        | 17 26 200 1103<br><b>17 26 200 2103</b> |  |
| Lower shield<br>for type Monoblock 47 connectors                                                  |                 |                                            | 17 26 000 4102                          |  |
| Lower shield<br>for type Monoblock 47 connectors (rows 1 – 22),<br>CompactPCI computer telephony  |                 |                                            | 17 24 000 4102                          |  |
| Lower shield<br>for type Monoblock 47 connectors (rows 23 – 27),<br>CompactPCI computer telephony |                 |                                            | 17 29 000 4102                          |  |
| Lower shield<br>for type Monoblock 47 connectors (rows 37 – 47),<br>CompactPCI computer telephony |                 |                                            | 17 23 000 4102                          |  |

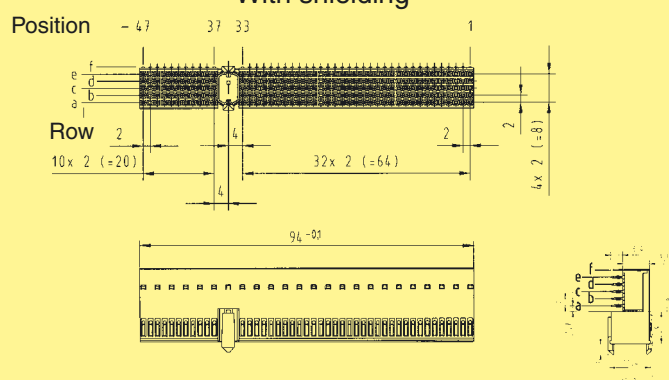
## Without shielding



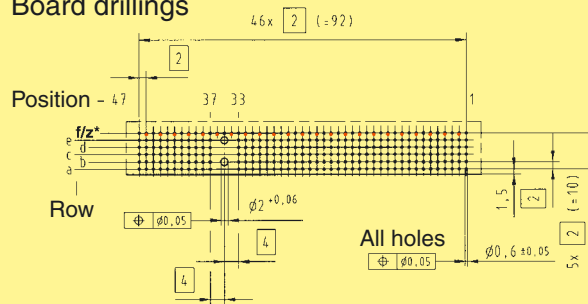
## Board drillings



## With shielding

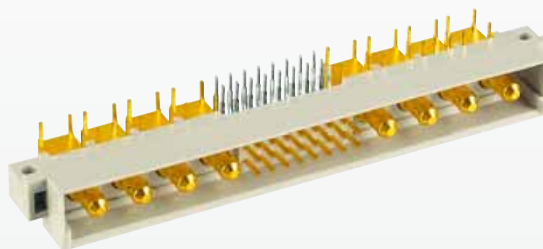


## Board drillings



Dimensions [mm]

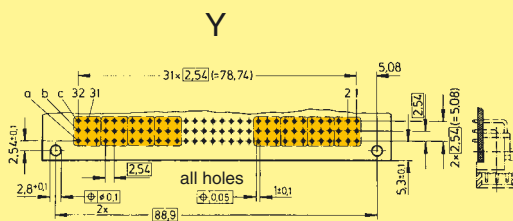
24+8



| Identification                         | Number of contacts | Contact arrangement                                                               | Part No.       | Performance levels according to DIN 41 612. Explanation chapter 00 |                |  |
|----------------------------------------|--------------------|-----------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------|----------------|--|
|                                        |                    |                                                                                   | 3              | 2                                                                  | 1              |  |
| Male connector with angled solder pins | 24 + 8             |  | 09 03 124 7901 | 09 03 124 6901                                                     | 09 03 124 2901 |  |

CompactPCI

Board drillings  
Mounting side



Dimensions in mm

24+8



| Identification                                                      | Number of contacts | Contact arrangement | Part No.<br>3                     | Performance levels according to DIN 41 612.<br>2 | Explanation chapter 00<br>1       |
|---------------------------------------------------------------------|--------------------|---------------------|-----------------------------------|--------------------------------------------------|-----------------------------------|
| <b>Female connector</b><br>with press-in terminations<br><br>4.5 mm | 24 + 8             |                     | Performance level 3<br>on request | 09 03 224 6830                                   | Performance level 1<br>on request |
| <b>High current female contact</b><br>with press-in termination     |                    | 30 A                | 09 03 000 6250                    |                                                  |                                   |

Order high current, high voltage, coaxial and fibre optic contacts separately, see chapter 09

M2.5.102.8

85

90

50

27

10.8

Technical drawing of a plate with 31 holes. The drawing shows the following dimensions and features:

- Overall Dimensions:**
  - Width:  $2x$  (with a note  $2,54 (=5,08)$ )
  - Height:  $2x$  (with a note  $2,54 (=5,08)$ )
- Hole Dimensions:**
  - Top row:  $\phi 2,8^{+0,1}$  (for the first hole) and  $\phi 1^{+0,09}_{-0,06}$  (for the remaining holes).
  - Bottom row:  $\phi 0,05$  (for the first hole) and  $\phi 0,05$  (for the remaining holes).
- Hole Positions:**
  - Top row: 31 holes, numbered 31, 28, 25, 22, 11, 8, 5, 2.
  - Bottom row: 8 holes, numbered 7, 6, 2, 5, 8, 2, 5, 4.
- Other Dimensions:**
  - Distance between the first hole in the top row and the first hole in the bottom row:  $0,3 \pm 0,1$ .
  - Distance between the first hole in the top row and the first hole in the bottom row:  $2$ .
  - Distance between the first hole in the top row and the first hole in the bottom row:  $7,62$ .
  - Distance between the first hole in the top row and the first hole in the bottom row:  $5,08$ .
  - Distance between the first hole in the top row and the first hole in the bottom row:  $5,08$ .
  - Distance between the first hole in the top row and the first hole in the bottom row:  $7x2,54 (=17,78)$ .
  - Distance between the first hole in the top row and the first hole in the bottom row:  $(73,66)$ .
  - Distance between the first hole in the top row and the first hole in the bottom row:  $90 \pm 0,1$ .
- Position and Row Labels:**
  - Position:  $a$  and  $b$ .
  - Row:  $a$  and  $b$ .

Dimensions in mm

**VME64x configuration\***

Page

|                                    |              |
|------------------------------------|--------------|
| VME64x – general information ..... | <b>04.02</b> |
| VME64x – male connectors .....     | <b>04.03</b> |
| VME64x – female connectors .....   | <b>04.05</b> |

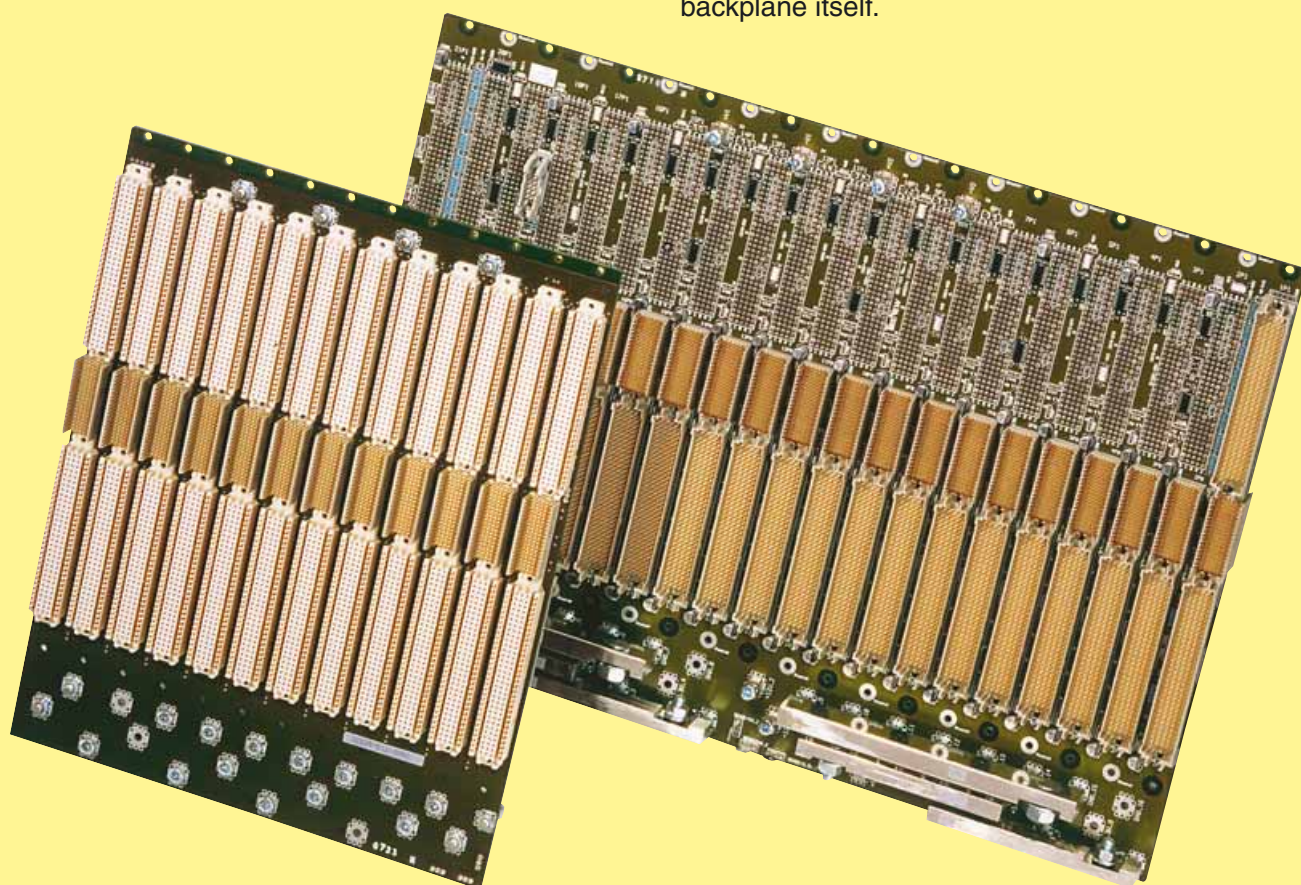


\* For 5-row DIN compatible connectors (*har-bus® 64*) see separate catalogue



The VMEbus has evolved over a period of more than 15 years to become the leading bus architecture in open industrial applications. The specification is an ANSI norm the original specification has been extended to become a draft standard VME64x ANSI/VITA 1.1-1997. This draft standard includes the specification for the new 5-row DIN compatible connector (IEC 61076-4-113) and for a centre connector J0/P0 on 6U VME cards, which is identical to J3/P3 in *CompactPCI*® systems.

In VMEbus systems it is possible to use custom connectors in the J0/P0 area (e.g. coax connectors). To prevent problems with non-mating backplanes it is strongly recommended to use front panel keying. The IEEE 1101 documents J0/P0 can also be used with rear transition modules for pluggable I/O cabling. As mentioned above, the contacts on this connector may be bussed. One example is the ATM CellBus, which is in the process of being standardised. The bus on J0/P0 connectors might actually be a plug-on mezzanine backplane rather than conducting traces integrated into the backplane itself.



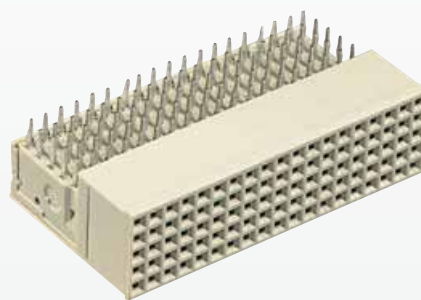
The 2.0 mm J0/P0 connector in VME64x systems is used for additional I/O, for new high speed sub busses or I/O for mezzanine modules, e.g. IP modules on VMEbus boards. The connector is placed on the Eurocard to work in combination with the non-metric original VMEbus connectors or the newer 5-row connector. The mounting location and dimensions for the J0/P0 VMEbus connector (IEC 61076-4-101) is specified in IEEE 1101.11. The VMEbus 2.0 mm connector uses 5 columns of signal contacts and as an option has an additional outer column on either side for shielding. All 95 signal contacts are user defined.



04  
03

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**



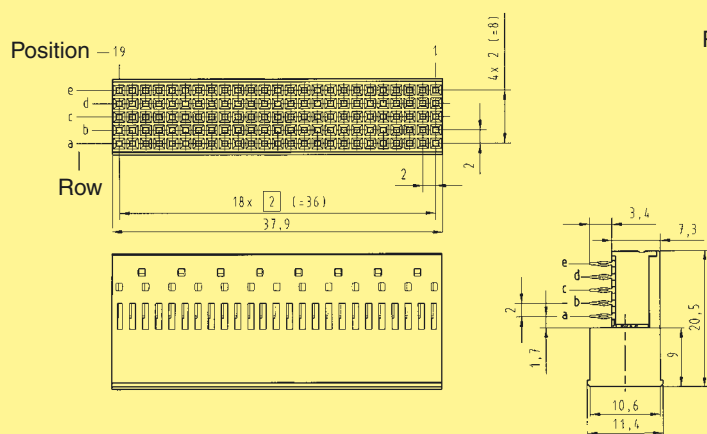


## Female connectors, angled

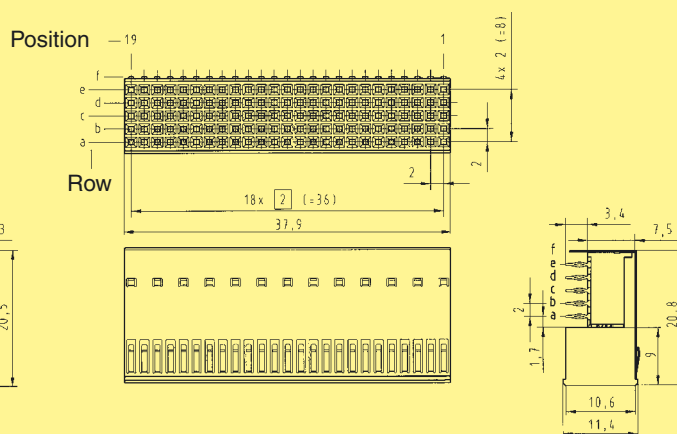
| Identification                                         | No. of contacts | Contact length [mm]<br>termination<br>side | Part number                      |  |
|--------------------------------------------------------|-----------------|--------------------------------------------|----------------------------------|--|
| Type B,<br>VME                                         | 95              | 3.4                                        | 17 25 095 1101<br>17 25 095 2101 |  |
| Type B,<br>VME with upper shield                       | 95              | 3.4                                        | 17 25 095 1102<br>17 25 095 2102 |  |
| Lower shield<br>for type B connectors with 95 contacts |                 |                                            | 17 25 000 4102                   |  |

VME64X

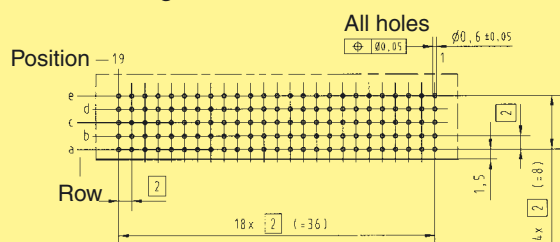
## Without shielding



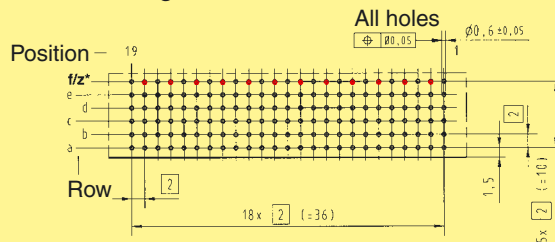
## With shielding



## Board drillings



## Board drillings



Dimensions [mm]



# Realtime

Animationen, Videoclips, in einem System, in dem diese Infor-

niedener Me  
der, Grafiken, Mu'

Animationen, (aus vielen Nationen bestr  
in vielen Staaten vertreten,,  
Unternehmen:  
tig), ...ip||e ( )  
(Geh...

**multiple-choice-Verfahren**, auch **multiple-choice-Verfahren** [**mal**-**ti**-**ple**-**cho**ys, 1. Pers. S. G. dr.] (FPrüf-

## SMC (Surface Mount Compatible) types

Page

**harbus® HM+** connector system – general information ..... **05.02**

Solder requirements ..... **05.03**

SMC connectors ..... **05.04**

### ***Angled female connectors\****

Type A ..... **05.05**

Type B ..... **05.06**

Type C ..... **05.07**



The continuing trend towards miniaturisation has revolutionised the assembly of electronic components. For the past 15 years, most components have been secured directly to the pcb surface by means of Surface Mount Technology (SMT). By dispensing with drilled holes on the pcb, a space saving of up to 70 percent is achieved.

Today, typical components such as ICs, resistors, capacitors, inductors, and connectors with straight terminal pins are almost exclusively fitted using SMD (Surface Mount Device) technology in mass production. In contrast, angled SMD connectors at the edge of the board have not been successful because of tolerance problems (co-planarity) and stresses during mating.

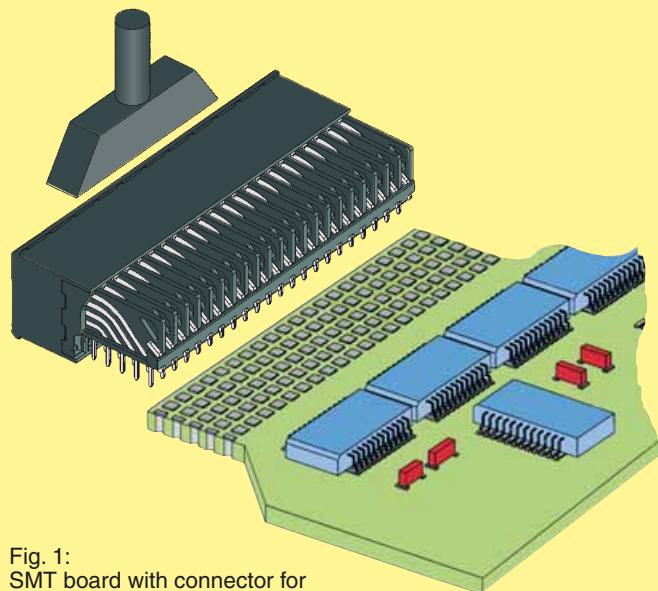


Fig. 1:  
SMT board with connector for  
"Pin in Hole Intrusive Reflow" assembly

### "Pin in Hole Intrusive Reflow"\*

In this process, the connector is inserted into plated through holes in a comparable way to conventional component mounting. All other components can be assembled on the pcb surface.

The components are positioned using pick-and-place machines. These automatic assembly machines differ according to whether the components are small, light-weight or bulky. Connectors, compared to ICs, are considered bulky (odd form). They are more difficult to grip, due to their comparatively heavy weight and larger size. But machines for odd form components, provide the higher insertion power, necessary to fit the components into pcb holes, which are filled with solder paste. Generally modern SMC production lines

are equipped with both types of machine. Therefore the "Pin in Hole Intrusive Reflow" process entails no extra investment costs for the user.

### Conventional assembly process:

1. Application of solder paste
2. Positioning the components
3. Positioning odd form components
4. Reflow soldering
5. Pressing in or partially dip soldering the connector at the board edge
6. Quality inspection

### "Pin in Hole Intrusive Reflow" assembly:

1. Application of solder paste
2. Positioning the components
3. Positioning odd form components
4. Reflow soldering
- ~~5. Pressing in or partially dip soldering the connector at the board edge~~
6. Quality inspection

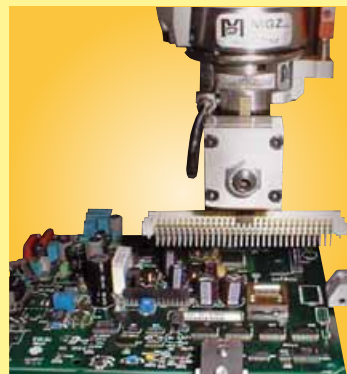


Fig. 2:  
Pick-and-place machine for  
odd form components  
(Courtesy of JOT Automation GmbH)

harbus® HM+ connector was designed for Pin in Hole Intrusive Reflow with features like an inspection friendly black colour, tape and reel packaging for automated handling and it is self retaining on pcb via kinked pin. The open design – moulded from high temperature resistant material – ensures good heat distribution, so that current solder temperature profiles can be used. The special material of the insulation body withstands also the higher temperatures of lead free soldering.

#### Advantages for using harbus® HM+ connectors are:

- Partial dip soldering or press fitting is no longer required
- High mechanical stability
- Complete compatibility with Surface Mount Technology
- Savings through integration into the automated assembly process
- Reduced floor space in the production plant

#### Application of solder paste

Before the components are assembled, solder paste is applied to all the solder pads and the plated through holes. Usually a screen printing process is used for this purpose. A squeegee moves across the pcb, which is masked with screens and presses the solder paste into all unmasked areas. A good solder joint is basically determined by the amount of the applied solder paste. Only a few parameters (illustrated on the right) will lead to the right quantity.

As an alternative to screen printing, the solder paste can be applied by means of a dispenser. A high-precision robot moves the dispenser to all required positions on the pcb. The dispensing method is particularly suitable for small pcb's or applications which demand high precision and flexibility in dispensing volumes.



Fig. 3: Dispenser in operation

#### Solder paste volume

There are numerous scientific studies dealing with calculation of the required quantity of solder paste. These studies use various parameters, e.g. the shrinking factor of the paste during soldering or the thickness of the screens used for masking the pcb. Since such calculation methods are complicated to apply, the following rule of thumb has proved valuable in practice:

$$V_{\text{Paste}} = 2(V_H - V_P)$$

in which:

$V_{\text{Paste}}$  = Required volume of solder paste

$V_H$  = Volume of the plated through hole

$V_P$  = Volume of the connector termination in the hole

Comment: the multiplier "2" compensates for solder paste shrinkage during soldering. For this purpose, it was assumed that 50 % of the paste consists of the actual solder, the other 50 % being soldering aids.

#### Requirements for the solder connection

At the beginning of a new production batch, the process parameters, such as quantity of solder paste and soldering temperature, can be set by interpreting simple cross-sections of the soldered connection. A reliable measure for achieving optimum parameters is the quantity of solder required to fill the hole. In soldered connections of high quality, the holes are filled to between 75 % and 100 %.

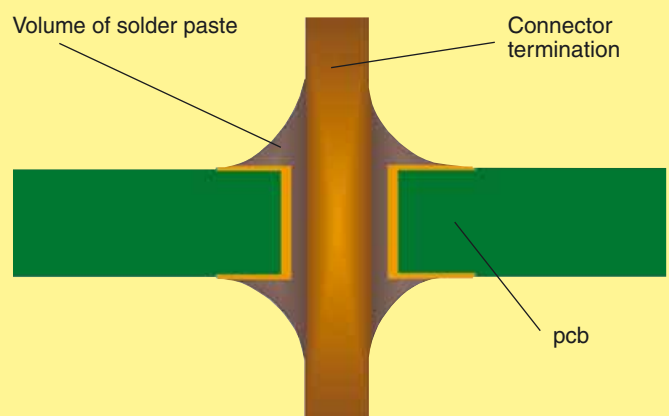


Fig. 4: Plated through hole with connector termination



## Requirements for SMC connectors

Conventional SMC (Surface Mount Compatible) connectors have to withstand temperatures of up to 225°C in the reflow oven for 10 to 15 seconds. Industry is moving towards lead free soldering with temperatures in the range of 235°C up to 260°C. Peak values might be above this level. Therefore, the moulding must be made from a dimensionally stable plastic which expands at the same rate as the pcb material when subjected to heat.

For the reflow soldering homogeneous heat distribution and unimpeded access for convection heat is important to reach all the solder joints. This is particularly necessary when dealing with the higher reflow temperatures of lead free soldering.

To meet this requirement, HARTING has introduced open slotted comb design. It guarantees good heat distribution to all soldered joints. Even contact row "a", which is most hidden by the nature of design, is heating up during the known soldering process.

With this new concept, hard metric 2 mm **harbus® HM+** connectors can now be fully integrated into the economic reflow soldering process.

## HARTING SMC technology

HARTING offers its customers a complete system concept for integrating SMC technology into existing production lines. In addition to **harbus® HM+** connectors we manufacture a wide range of SMC connectors, e. g. 3- and 5-row connectors, in compliance with DIN 41 612, D-Sub connectors in compliance with DIN 41 651 and connectors from the har-mik® series with contact spacing of 1.27 millimetres. In addition, HARTING supports the market with packaging and processing concepts, which have been developed in collaboration with renowned manufacturers of SMC soldering and assembly plants.

**You will find more detailed information in our SMC catalogue, as well as in our DIN 41 612 connectors catalogue.**

**harbus® HM+** connectors are ideally suited for fully automated assembly.

The benefits are:

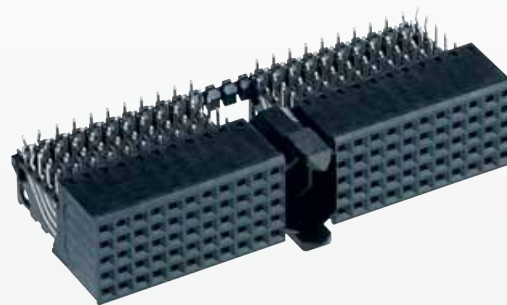
- Compatible to conventional press fit connectors
- High mechanical stability
- Compatible to existing board layout
- Cost reduction by process step elimination
- Lead free soldering process



Fig. 5: HARTING connector mounted in a tape ready for automatic placement.



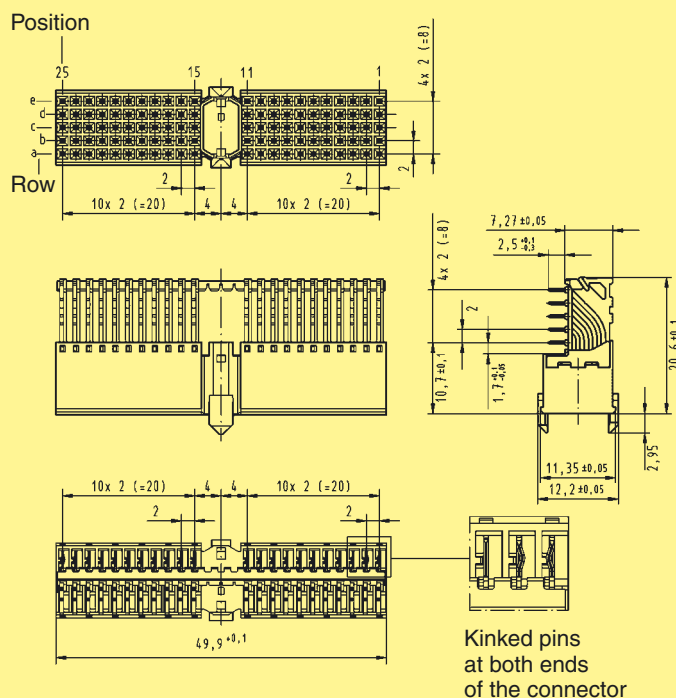
Fig. 6: **harbus HM+** connector



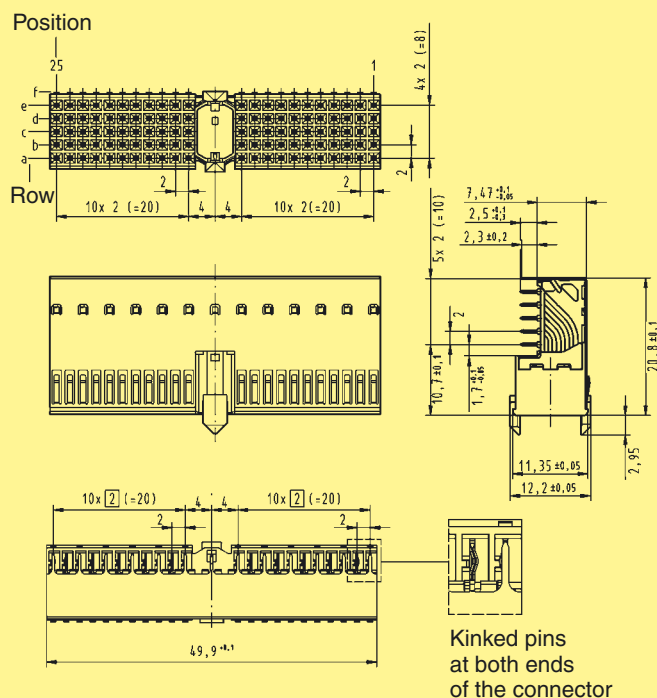
## Female connectors, angled

| Identification              |  | No. of contacts | Contact length [mm]<br>termination side | Part number                             |  |
|-----------------------------|--|-----------------|-----------------------------------------|-----------------------------------------|--|
| Type A                      |  | 110             | 2.5                                     | 17 21 110 1801<br><b>17 21 110 2801</b> |  |
| Type A<br>with upper shield |  | 110             | 2.5                                     | 17 21 110 1802<br><b>17 21 110 2802</b> |  |

without shielding

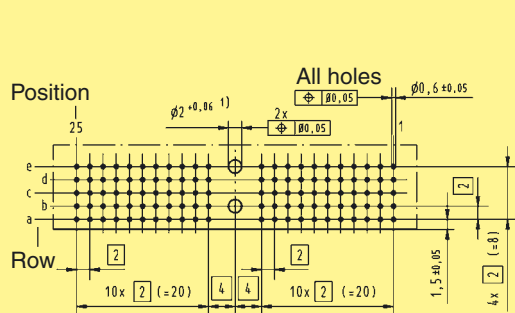


with shielding

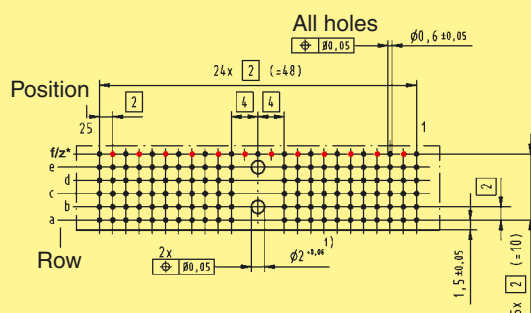


## Board drillings

Diameter of drillings:  $\varnothing 0.7 \pm 0.02$  mm  
Diameter of plated through holes:  $\varnothing 0.6 \pm 0.05$  mm



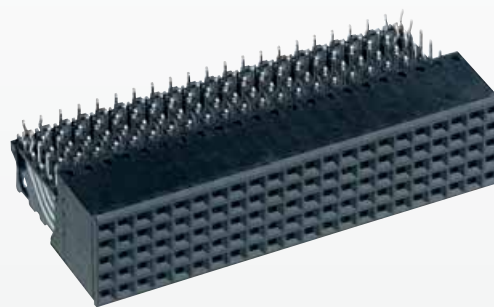
### 1) Non-metallized drillings



Dimensions [mm]

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

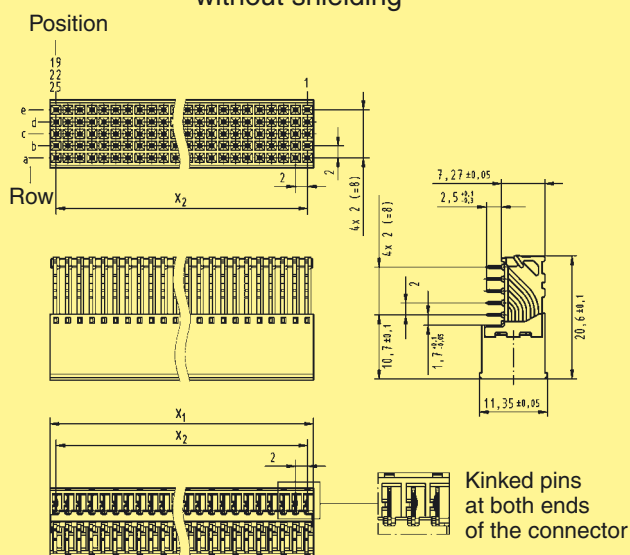
\* hole on even contact numbers  
only needed for lower shielding



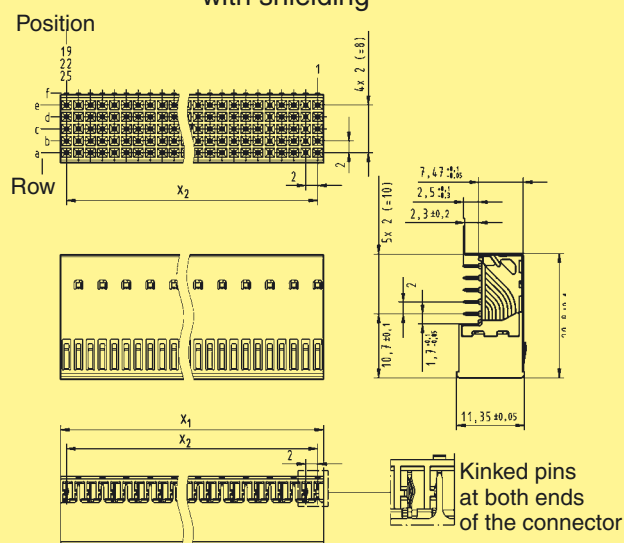
Female connectors, angled

| Identification              | No. of contacts | Contact length [mm]<br>termination<br>side | Part number                             |  |
|-----------------------------|-----------------|--------------------------------------------|-----------------------------------------|--|
| Type B                      | 95              | 2.5                                        | 17 25 095 1801<br><b>17 25 095 2801</b> |  |
| Type B<br>with upper shield | 95              | 2.5                                        | 17 25 095 1802<br><b>17 25 095 2802</b> |  |
| Type B                      | 110             | 2.5                                        | 17 24 110 1801<br><b>17 24 110 2801</b> |  |
| Type B<br>with upper shield | 110             | 2.5                                        | 17 24 110 1802<br><b>17 24 110 2802</b> |  |
| Type B                      | 125             | 2.5                                        | 17 22 125 1801<br><b>17 22 125 2801</b> |  |
| Type B<br>with upper shield | 125             | 2.5                                        | 17 22 125 1802<br><b>17 22 125 2802</b> |  |

without shielding



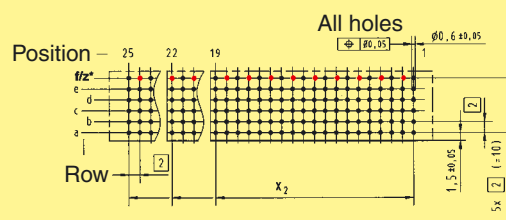
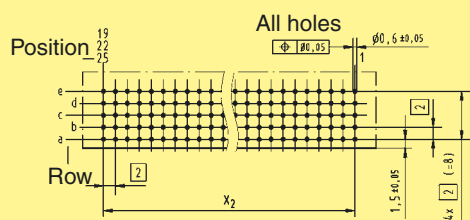
with shielding



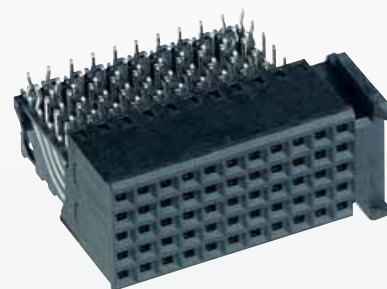
Board drillings

Diameter of drillings:  $\varnothing 0.7 \pm 0.02 \text{ mm}$   
 Diameter of plated through holes:  $\varnothing 0.6 \pm 0.05 \text{ mm}$

| Contact positions | x <sub>1</sub> | x <sub>2</sub>       |
|-------------------|----------------|----------------------|
| 19                | 38             | 18 x <b>2</b> (= 36) |
| 22                | 44             | 21 x <b>2</b> (= 42) |
| 25                | 50             | 24 x <b>2</b> (= 48) |



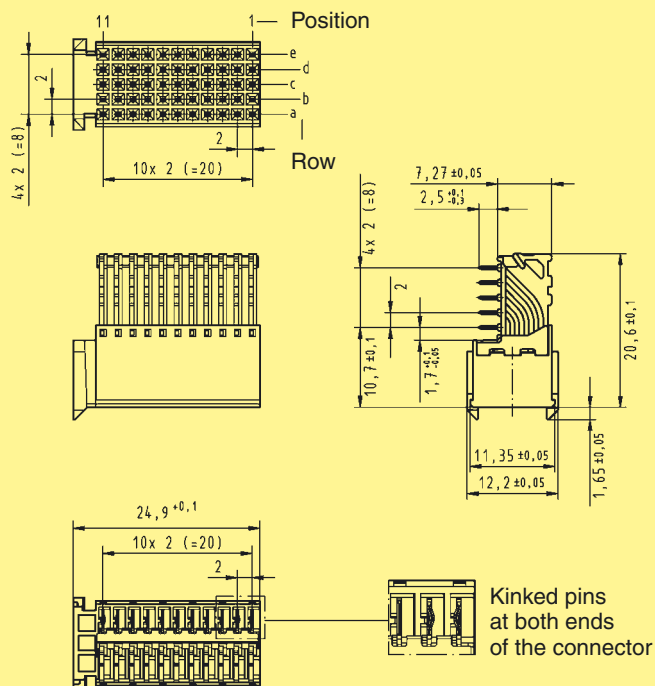
Dimensions [mm]



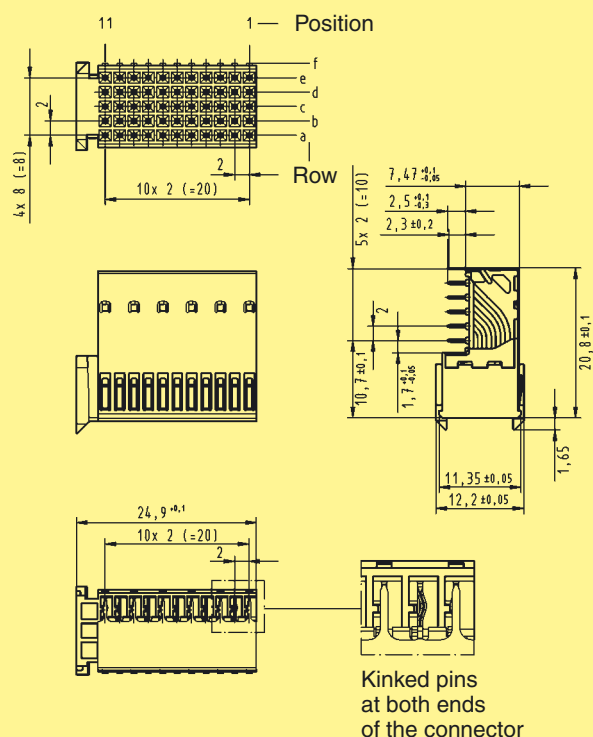
Female connectors, angled

| Identification              | No. of contacts | Contact length [mm]<br>termination<br>side | Part number                      |  |
|-----------------------------|-----------------|--------------------------------------------|----------------------------------|--|
| Type C                      | 55              | 2.5                                        | 17 23 055 1801<br>17 23 055 2801 |  |
| Type C<br>with upper shield | 55              | 2.5                                        | 17 23 055 1802<br>17 23 055 2802 |  |

without shielding

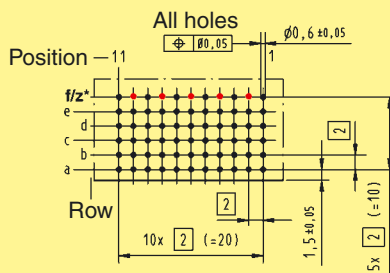
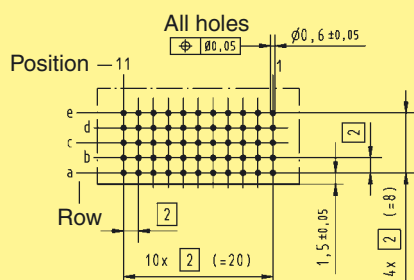


with shielding



Board drillings

Diameter of drillings:  $\varnothing 0.7 \pm 0.02$  mm  
Diameter of plated through holes:  $\varnothing 0.6 \pm 0.05$  mm



Dimensions [mm]



## Accessories / power connectors

Page

|                                     |       |
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| Coding keys .....                   | 06.02 |
| Shrouds – general information ..... | 06.03 |
| Shrouds type A .....                | 06.04 |
| Shrouds type B .....                | 06.05 |
| Shrouds type AB .....               | 06.06 |
| Shrouds type C .....                | 06.07 |
| Guiding system .....                | 06.08 |
| Type L – male connectors .....      | 06.09 |
| Type N – male connectors .....      | 06.10 |
| Type L – female connectors .....    | 06.11 |
| Type N – female connectors .....    | 06.12 |

Coding keys are used to prevent mismatching of boards. They can be inserted into the multifunctional area of male and female connectors with special tooling. This can be easily done after the connectors have been pressed in.

To identify coding keys very simply they have different bright and pre-defined RAL colours. In the table below the colours and code numbers in acc. to the IEC 61076-4-101 are listed. They will be used for the following applications:

- Cadmium yellow for CompactPCI to identify 3.3 V bus signalling
- Brilliant blue for CompactPCI to identify 5.0 V bus signalling
- Reseda green to prevent accidental board insertion in VME64x on CompactPCI applications
- Strawberry red to prevent accidental board insertion in telephony applications
- Pastel orange for user defined bus
- Nut brown for rear I/O and user I/O

### Coding keys for male connectors

| Coding key | Code number | Colour                                        | Part number    |
|------------|-------------|-----------------------------------------------|----------------|
|            | 3568        | Pastel orange<br>RAL 2003                     | 17 79 000 0010 |
|            | 3467        | Slate grey<br>RAL 7015                        | 17 79 000 0012 |
|            | 3456        | Cadmium yellow<br>RAL 1021<br>for CPCI, 3.3 V | 17 79 000 0013 |
|            | 2578        | Reseda green<br>RAL 6011                      | 17 79 000 0014 |
|            | 1567        | Brilliant blue<br>RAL 5007<br>for CPCI, 5.0 V | 17 79 000 0015 |
|            | 1356        | Blue lilac<br>RAL 4005                        | 17 79 000 0016 |
|            | 1248        | Strawberry red<br>RAL 3018                    | 17 79 000 0018 |
|            | 1236        | Nut brown<br>RAL 8011                         | 17 79 000 0019 |

### Coding keys for female connectors

| Coding key | Code number | Colour                                        | Part number    |
|------------|-------------|-----------------------------------------------|----------------|
|            | 1247        | Pastel orange<br>RAL 2003                     | 17 79 000 0020 |
|            | 1258        | Slate grey<br>RAL 7015                        | 17 79 000 0022 |
|            | 1278        | Cadmium yellow<br>RAL 1021<br>for CPCI, 3.3 V | 17 79 000 0023 |
|            | 1346        | Reseda green<br>RAL 6011                      | 17 79 000 0024 |
|            | 2348        | Brilliant blue<br>RAL 5007<br>for CPCI, 5.0 V | 17 79 000 0025 |
|            | 2478        | Blue lilac<br>RAL 4005                        | 17 79 000 0026 |
|            | 3567        | Strawberry red<br>RAL 3018                    | 17 79 000 0028 |
|            | 4578        | Nut brown<br>RAL 8011                         | 17 79 000 0029 |



HARTING's *har-bus® HM* shrouds protect the pins protruding the rear side of the backplane from irregular mating tolerances, thus ensuring a quality connection.

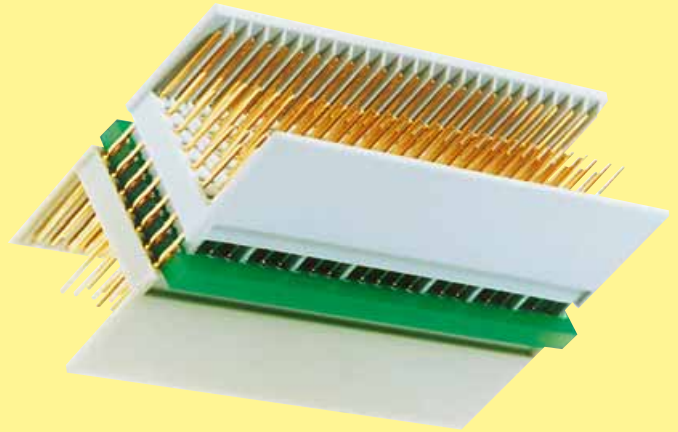
To accommodate pcb thickness, from 1.6 up to 4 mm nominal, the shrouds have integrated standoffs of corresponding height.

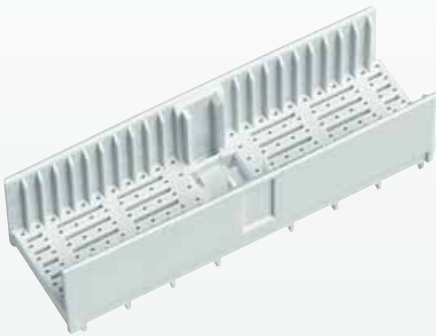
Thus forming a one piece solution that reduces assembling cost significantly.

The shroud can be mounted without the additional requirement of spacers to ensure the desired pin lengths on the rear side of the pcb.

Fixing of the component is carried out on the rear post via a smooth friction fit process.

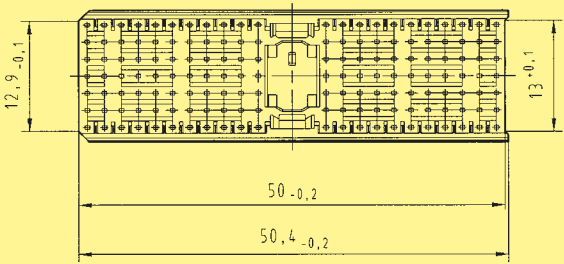
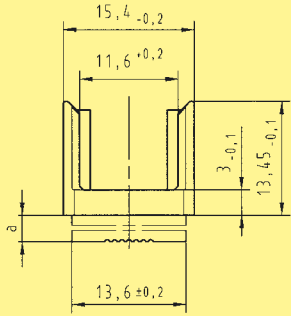
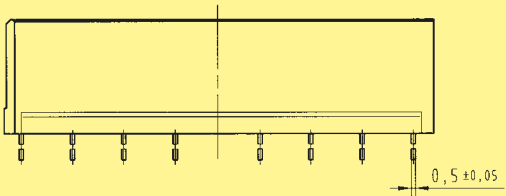
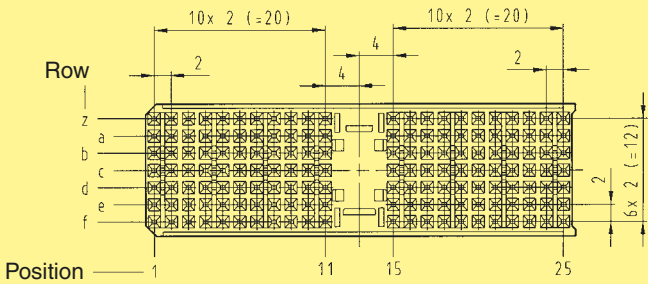
For ease of assembly the same tooling as for the press fit connectors on the front side is utilised for assembly.



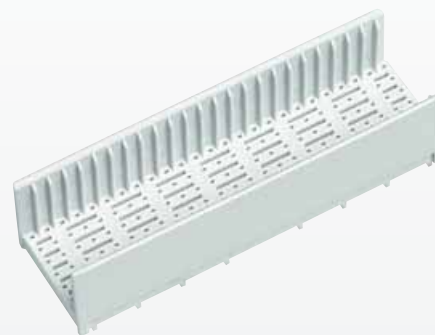


| Identification                | Board thickness [mm] | Part number    |
|-------------------------------|----------------------|----------------|
| Type A shroud<br>25 positions | 1.6 ± 0.4            | 17 70 000 1001 |
|                               | 2.4 ± 0.4            | 17 70 000 1002 |
|                               | 3.2 ± 0.4            | 17 70 000 1003 |
|                               | 4.0 ± 0.4            | 17 70 000 1004 |

Dimensions



| Board thickness [mm] | a [mm]     |
|----------------------|------------|
| 1.6 ± 0.4            | 3.1 ± 0.05 |
| 2.4 ± 0.4            | 2.3 ± 0.05 |
| 3.2 ± 0.4            | 1.5 ± 0.05 |
| 4.0 ± 0.4            | 0.7 ± 0.05 |



Identification

Board thickness [mm]

Part number

Type B shroud

25 positions

1.6 ± 0.4  
2.4 ± 0.4  
3.2 ± 0.4  
4.0 ± 0.4

17 70 000 2001  
17 70 000 2002  
17 70 000 2003  
17 70 000 2004

22 positions

1.6 ± 0.4  
2.4 ± 0.4  
3.2 ± 0.4  
4.0 ± 0.4

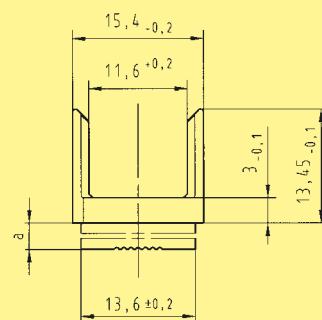
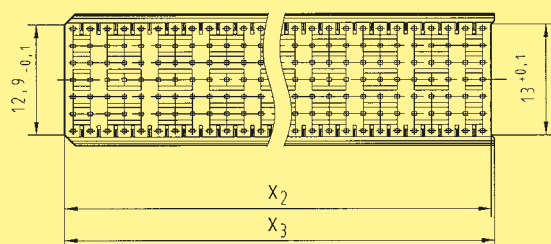
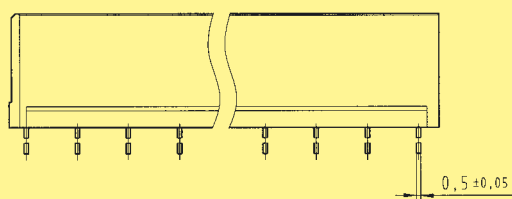
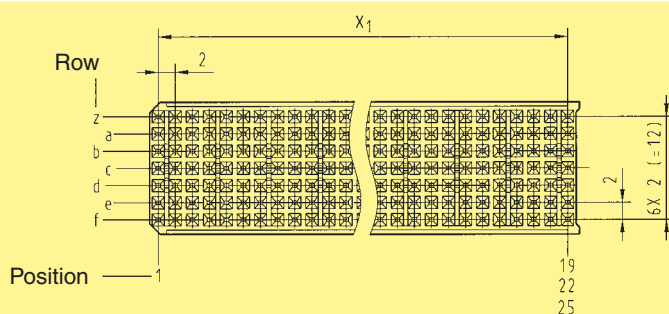
17 70 000 4001  
17 70 000 4002  
17 70 000 4003  
17 70 000 4004

19 positions

1.6 ± 0.4  
2.4 ± 0.4  
3.2 ± 0.4  
4.0 ± 0.4

17 70 000 5001  
17 70 000 5002  
17 70 000 5003  
17 70 000 5004

Dimensions



| Board thickness [mm] | a [mm]     |
|----------------------|------------|
| 1.6 ± 0.4            | 3.1 ± 0.05 |
| 2.4 ± 0.4            | 2.3 ± 0.05 |
| 3.2 ± 0.4            | 1.5 ± 0.05 |
| 4.0 ± 0.4            | 0.7 ± 0.05 |

| Contact positions | x <sub>1</sub> [mm] | x <sub>2</sub> [mm] | x <sub>3</sub> [mm] |
|-------------------|---------------------|---------------------|---------------------|
| 19                | 18 x 2 (= 36)       | 38 - 0.2            | 38.4 - 0.2          |
| 22                | 21 x 2 (= 42)       | 44 - 0.2            | 44.4 - 0.2          |
| 25                | 24 x 2 (= 48)       | 50 - 0.2            | 50.4 - 0.2          |

Dimensions [mm]



## Identification

## Board thickness [mm]

## Part number

## Type AB shroud

25 positions

 $1.6 \pm 0.4$  $2.4 \pm 0.4$  $3.2 \pm 0.4$  $4.0 \pm 0.4$ 

17 70 000 8001

17 70 000 8002

17 70 000 8003

17 70 000 8004

22 positions

 $1.6 \pm 0.4$  $2.4 \pm 0.4$  $3.2 \pm 0.4$  $4.0 \pm 0.4$ 

17 70 000 7001

17 70 000 7002

17 70 000 7003

17 70 000 7004

19 positions

 $1.6 \pm 0.4$  $2.4 \pm 0.4$  $3.2 \pm 0.4$  $4.0 \pm 0.4$ 

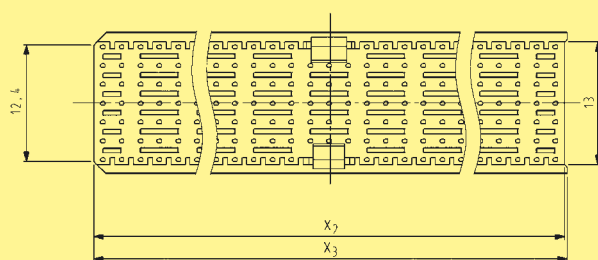
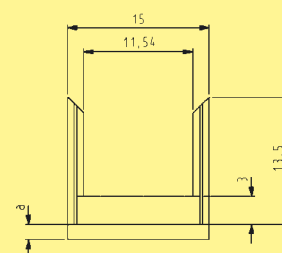
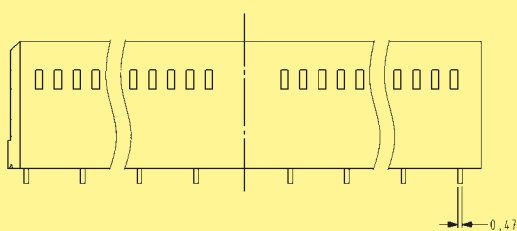
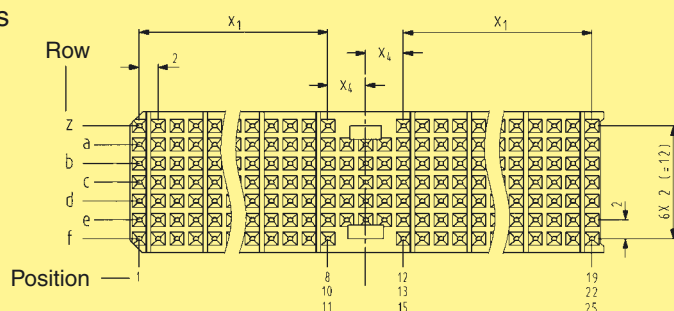
17 70 000 6001

17 70 000 6002

17 70 000 6003

17 70 000 6004

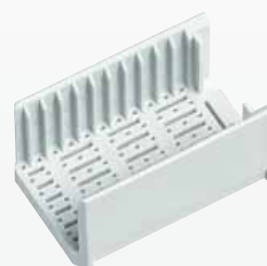
## Dimensions



| Board thickness [mm] | a [mm]         |
|----------------------|----------------|
| $1.6 \pm 0.4$        | $3.1 \pm 0.05$ |
| $2.4 \pm 0.4$        | $2.3 \pm 0.05$ |
| $3.2 \pm 0.4$        | $1.5 \pm 0.05$ |
| $4.0 \pm 0.4$        | $0.7 \pm 0.05$ |

| Contact positions | $x_1$ [mm]           | $x_2$ [mm] | $x_3$ [mm] | $x_4$ [mm] |
|-------------------|----------------------|------------|------------|------------|
| 19                | $7 \times 2 (= 14)$  | 37.9       | 38.2       | 4          |
| 22                | $8 \times 2 (= 16)$  | 43.9       | 44.2       | 3          |
| 25                | $10 \times 2 (= 20)$ | 49.9       | 50.2       | 4          |

Dimensions [mm]



Identification

Board thickness [mm]

Part number

Type C shroud

11 positions

$1.6 \pm 0.4$

$2.4 \pm 0.4$

$3.2 \pm 0.4$

$4.0 \pm 0.4$

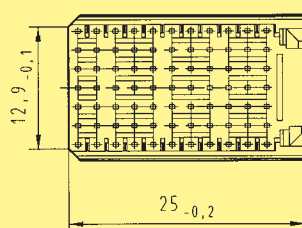
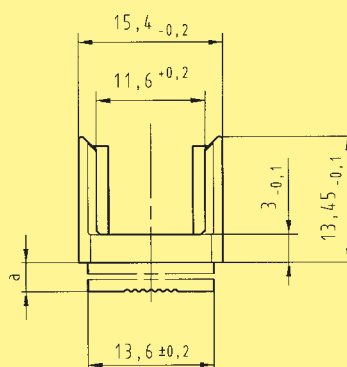
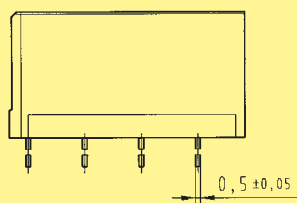
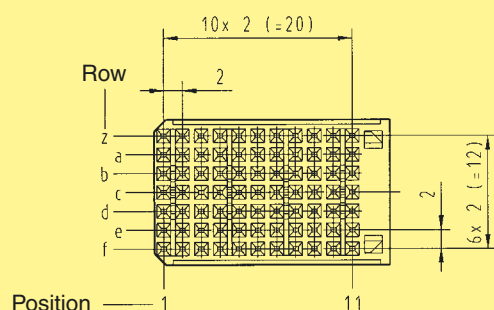
17 70 000 3001

17 70 000 3002

17 70 000 3003

17 70 000 3004

Dimensions



| Board thickness [mm] | a [mm]         |
|----------------------|----------------|
| $1.6 \pm 0.4$        | $3.1 \pm 0.05$ |
| $2.4 \pm 0.4$        | $2.3 \pm 0.05$ |
| $3.2 \pm 0.4$        | $1.5 \pm 0.05$ |
| $4.0 \pm 0.4$        | $0.7 \pm 0.05$ |



## Identification

## Part number

Guide pin

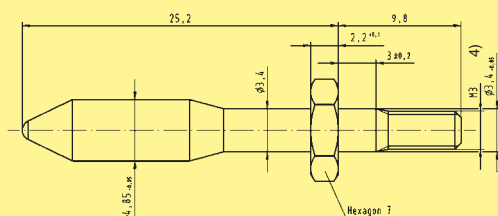
17 79 000 0080

## Receptacle for guide pin

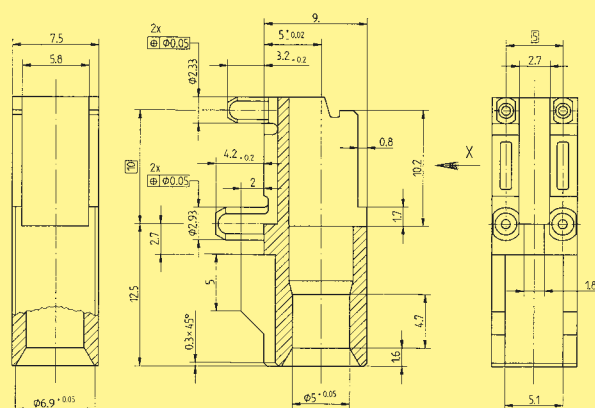
07 73 000 0280

## Dimensions [mm]

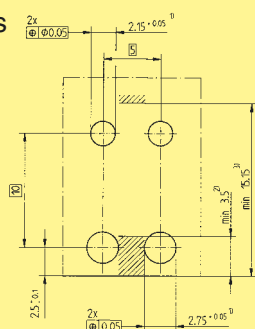
Guide pin



Receptacle  
for guide pin



Board drillings  
(View-X)



- 1) Non-metallised drillings
- 2) No tracks, except solder eyes
- 3) Limit area of components (valid for both pcb sides)
- 4) Recommended board drilling is 3.5 (-0.05) mm

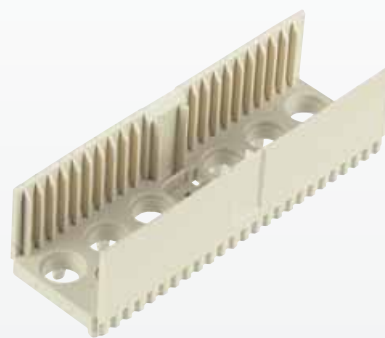
### General information

The guide pin solution from HARTING allows safe mating under sometimes extreme conditions. This might be large and heavy boards that bow under their own weight. Also insufficiently aligned or worn out rack systems can be tolerated better with the use of HARTING's guiding system, which also reduces the potential danger of damaging cards when being forced into flexing racks.

The guide pin and receptacle's design solution allows to overcome a 3 mm [.118"] offset between the backplane and the mating daughtercard. The reducing diameter of the pin (from 4.85 mm to 3.4 mm) ensures that it's positioning task is smoothly transferred to the connectors as soon as they start to engage. Finally the thin diameter section of the guide pin is no longer positioned by the ferrule of the receptacle, ensuring that the pin is able to freely follow any movement imposed by the engaging connector. This ensures that there is no static stress between the connectors and the guiding system.

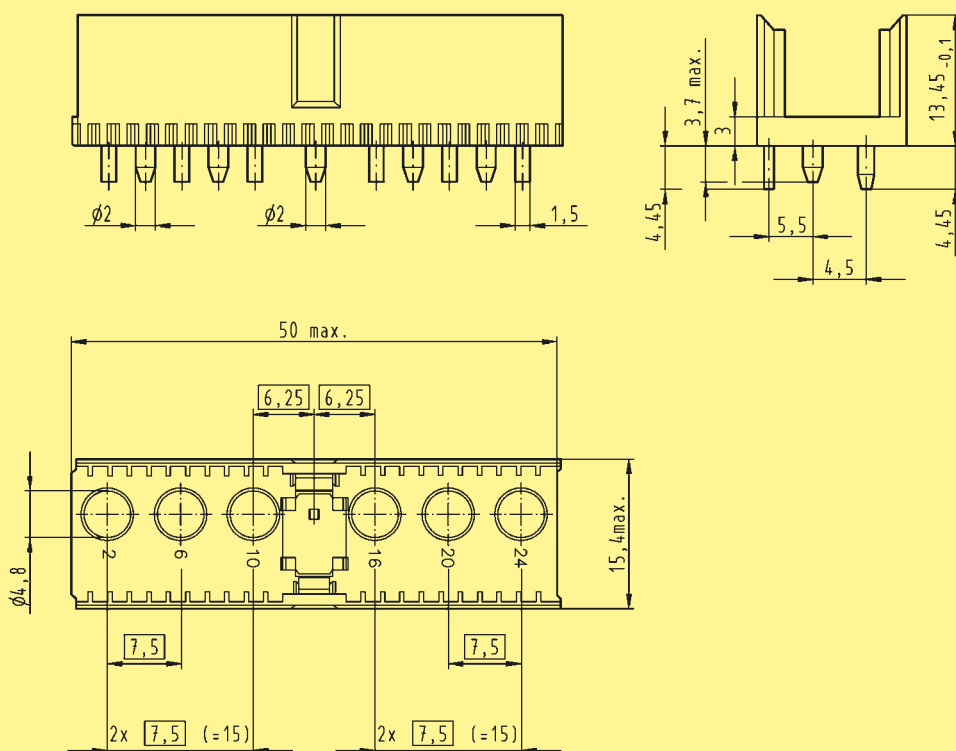
The rugged metal designed guide pin is screwed to the backplane with standard hexagon screws. Whereas the molded receptacle is designed with four press fit pegs that can be installed to the board together with the connectors.

The tooling can be ordered with the part numbers **0779 000 0157** (top tool) and **0779 000 0158** (bottom tool).

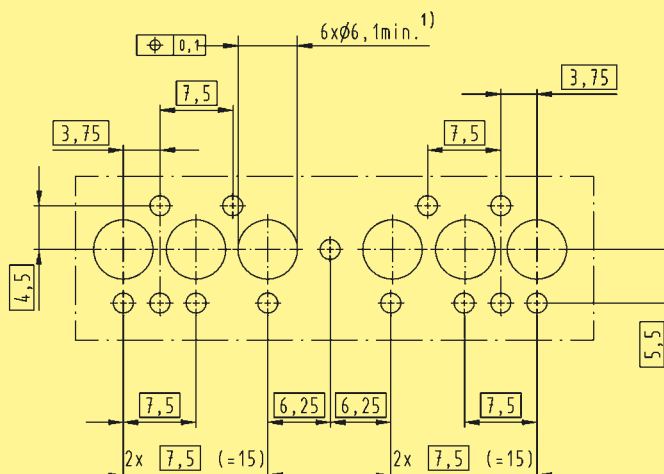


Male connector

| Identification | Number of contacts | Contact length [mm]<br>mating side | termination side | Part number    | Contact configuration |
|----------------|--------------------|------------------------------------|------------------|----------------|-----------------------|
| Type L         | max. 6*            |                                    |                  | 17 16 000 0001 |                       |



Board drillings



Dimensions [mm]

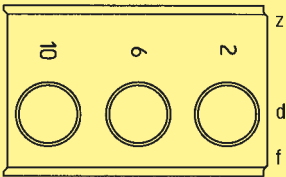
\* Order special contacts separately, see chapter 09.

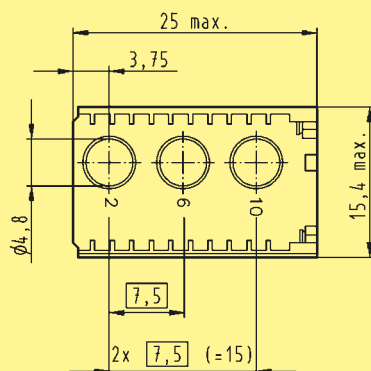
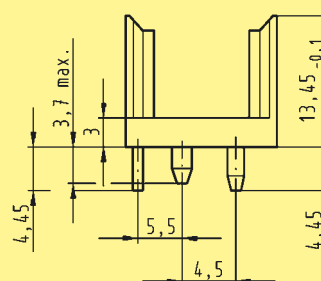
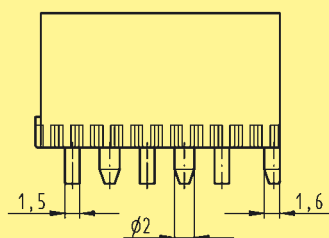
<sup>1)</sup> Non-metallized drillings



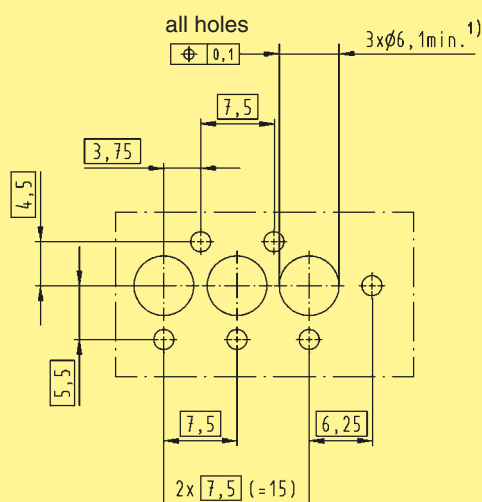


Male connector

| Identification | Number of contacts | Contact length [mm]<br>mating side | termination side | Part number    | Contact configuration                                                               |
|----------------|--------------------|------------------------------------|------------------|----------------|-------------------------------------------------------------------------------------|
| Type N         | max. 3*            |                                    |                  | 17 18 000 0001 |  |



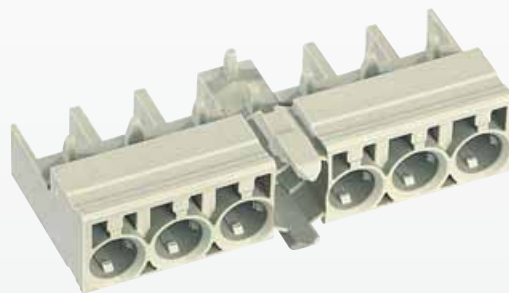
Board drillings



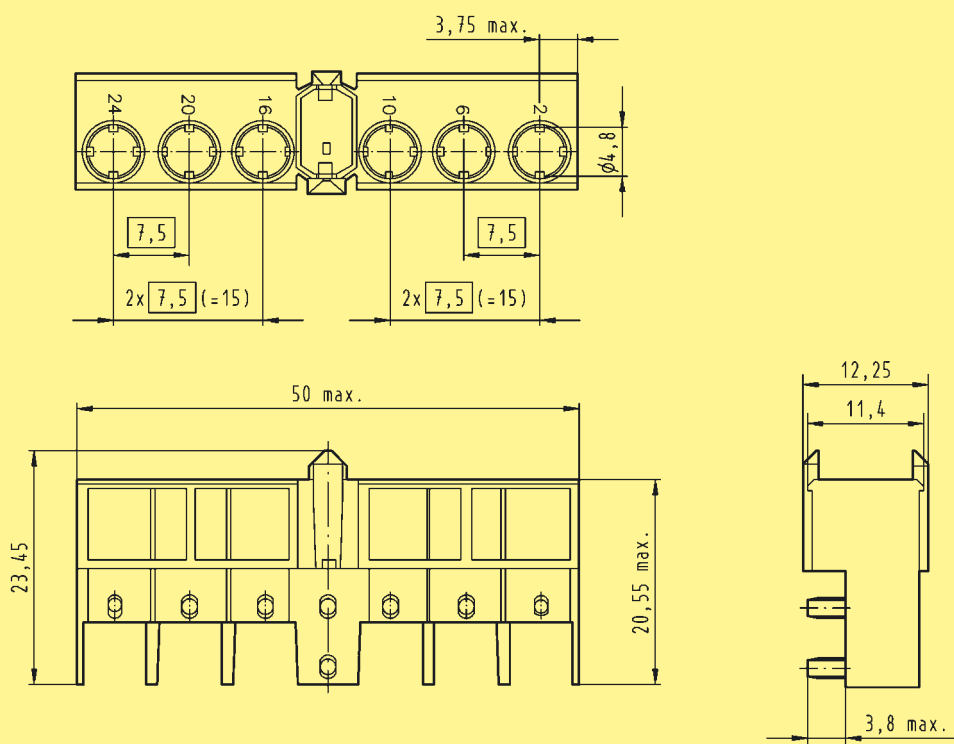
Dimensions [mm]

\* Order special contacts separately, see chapter 09.

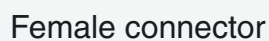
<sup>1)</sup> Non-metallized drillings



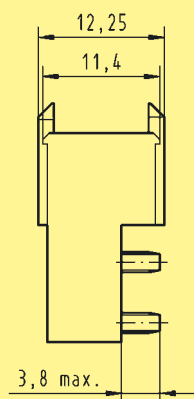
| Identification | Number of contacts | Contact mating side | length [mm]<br>termination side | Part number    | Contact configuration |
|----------------|--------------------|---------------------|---------------------------------|----------------|-----------------------|
| Type L         | max. 6*            |                     |                                 | 17 36 000 0001 |                       |

[illegible]

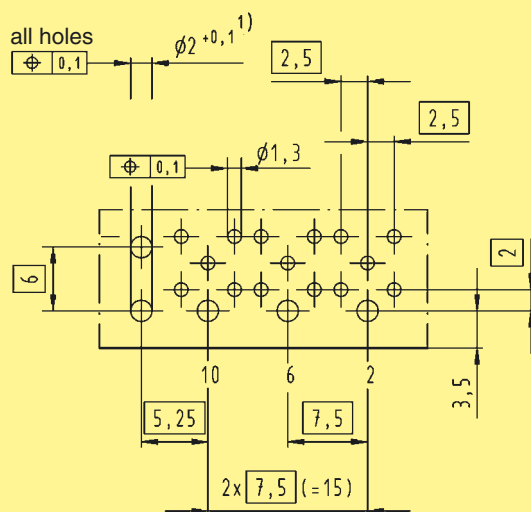
1) Non-metallized drillings



| Identification | Number of contacts | Contact mating side | Contact length [mm] termination side | Part number    | Contact configuration |
|----------------|--------------------|---------------------|--------------------------------------|----------------|-----------------------|
| Type N         | max. 3*            |                     |                                      | 17 38 000 0001 |                       |



## Board drillings



Dimensions [mm]

# High frequency / transmission characteristics

Page

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The demand of passive electronic components (pcb's and plug connectors) have increased drastically with the multi-media age. Large data packets must be transmitted without interference by intelligent algorithms and very high speeds around circuit boards and connectors. Only by the right choice of the components a smooth transfer of data can be created.

For constant improvement of our actual products and to develop solutions for advanced high frequency connections in the future, a special team of engineers has been installed at HARTING. This group calculates connection systems by the means of signal integrity and interprets it by electromagnetic simulations and measurements. Our engineers are not focusing only on the connector. The whole system, consisting of transceiver, circuit board (including connection technique) and connector is analysed, because connector and pcb cannot be separated.

HARTING connectors are developed by means of modern simulation and measurement methods. The transmission characteristics of our connectors are determined and used as basis for the connector construction. To carry out measurements for

connectors, special test sets which get close to real applications have been developed.

HARTING offers you a special connector design-in support for desired applications and we provide SPICE models for numerous connectors to allow whole system simulation for our customers.

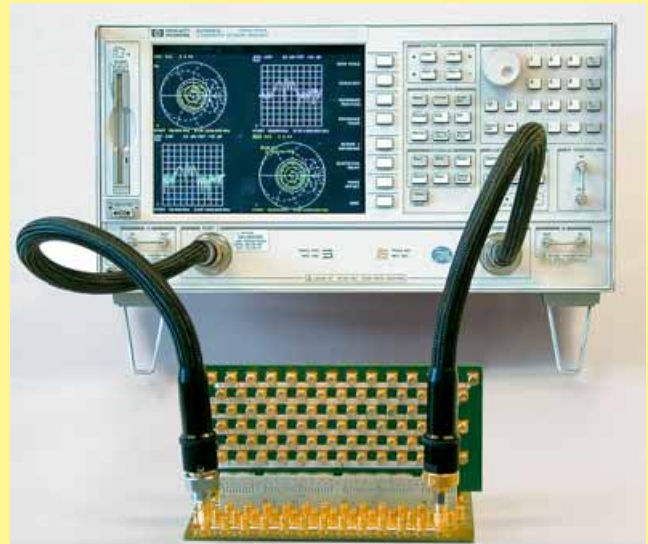


Fig. 1: 40 GHz network analyser

## Simulation- and measurement technique

To determine the measurement parameters of the connector the necessary instruments required is a Time Domain Reflectometer (TDR) and a broadband NetWork Analyser (NWA). The interested parameters are:

### **Time domain**

- Impedance
- Reflection coefficient
- Eye opening
- Rise time degradation
- Propagation delay

### **Frequency domain**

- Crosstalk
- Return loss
- Insertion loss

Since test boards, prototyping and measurements are time consuming and expensive, connectors are characterised by computer simulation. With the FEM (Finite Elemente Method) the CAD geometry becomes subdivided into single elements and the field solver calculates the electromagnetic fields. With the raw data e.g. SPICE models are developed and being provided for the customers to coordinate the system with the qualities of the connector in the planning phase.

The calibrating techniques are of particular importance when investigating connector parameters. Due to the fact that the connector is integrated into a test board one has to remove the parameters of the connector itself. The method of gating is one possibility to eliminate the test launchers that reduces the performance of the transmission characteristics due to it's discontinuities and rise time degradation. This means that the interconnection to the pcb cannot be separated from the connector in the measured curve.



It is possible to generate both single line models and multiline models for the connector. To convert the raw data from the FEA (Finite Element Analysis) of the connector geometry into a SPICE netlist, HARTING has developed the software F2Swin. Using this software the individual assignment is shown in a matrix of 5 columns and 5 rows and the SPICE netlist can be integrated as subcircuit in an

easy way. The connector itself is represented by LC ladders. The amount of the LC ladders can be controlled with the length of the cross-sections of the connector. By this way very accurate models up to 3 GHz can be generated, providing many comparisons between measurements and simulations.

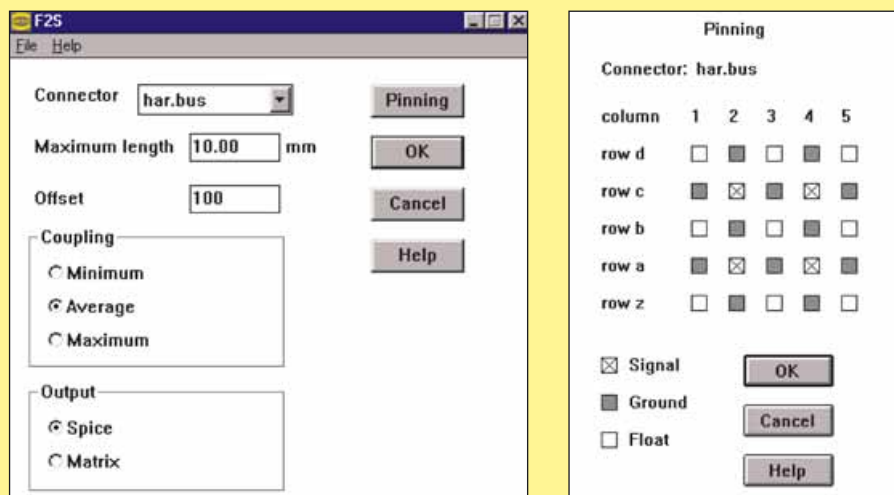


Fig. 2: Screenshot of F2Swin software

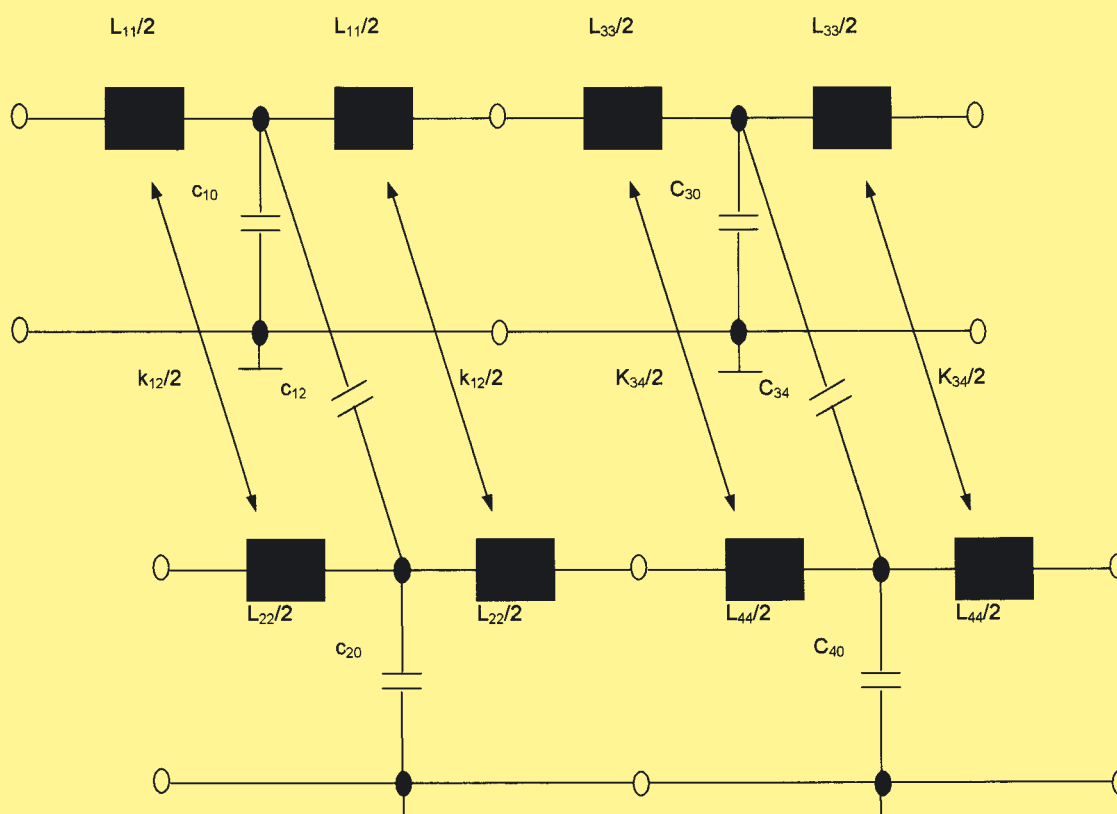


Fig. 3: Equivalent circuit for connectors with 2 coupled lines based on F2Swin software



The gating happens in the following way: The active return loss is measured for the complete signal path with a broadband network analyser and transformed via the Inverse Fast Fourier Transformation (IFFT) into the time domain. The transition of the connector

can be determined exactly from the time domain curve. In the range of the connector a gating window will be positioned and this data is changed back into the frequency domain via the Fourier back transformation.

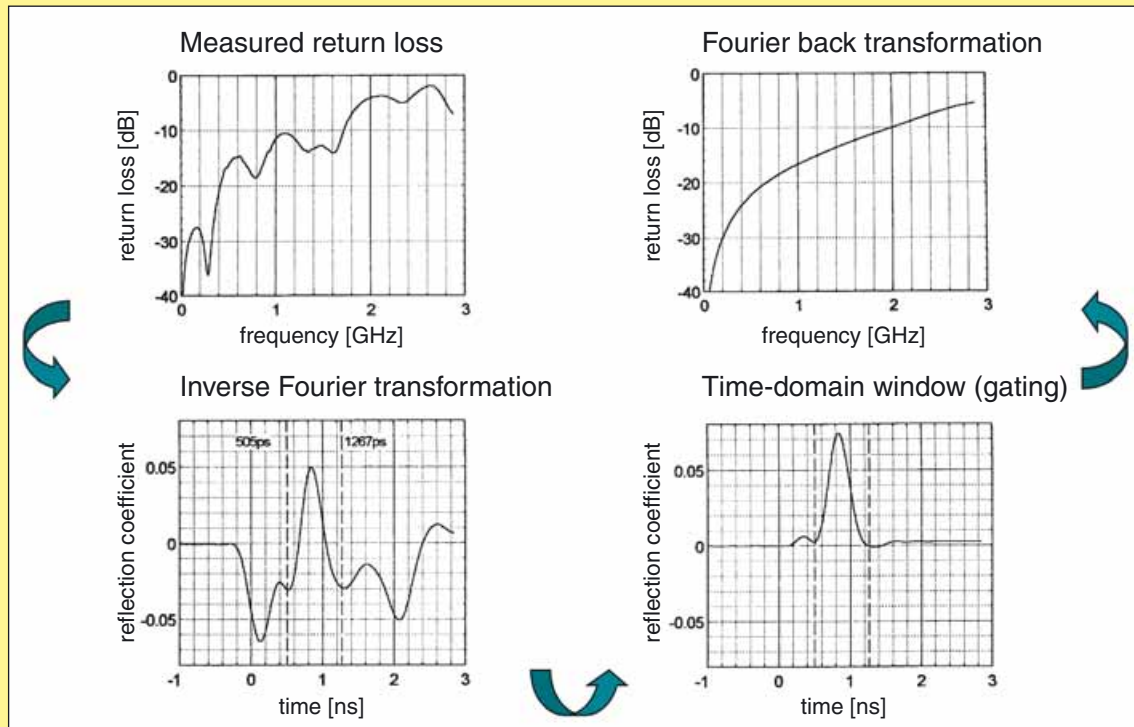


Fig. 4: Gating procedure to eliminate launcher

The test boards (see Fig. 5) are executed in stripline technology with impedance matched traces and various pin pattern. One signal path from the daughtercard to the backplane consists of:

- SMA
- 50  $\Omega$  trace

- Angled connector
- Straight connector
- 50  $\Omega$  trace
- SMA

The SMA connectors as well as *har-bus*<sup>®</sup> HM connectors are in press-fit technology.

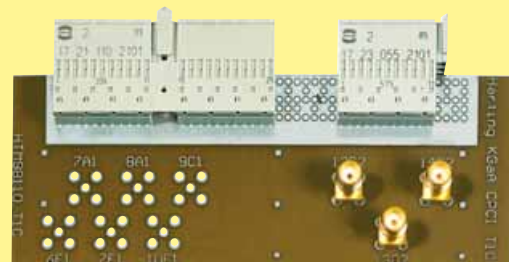
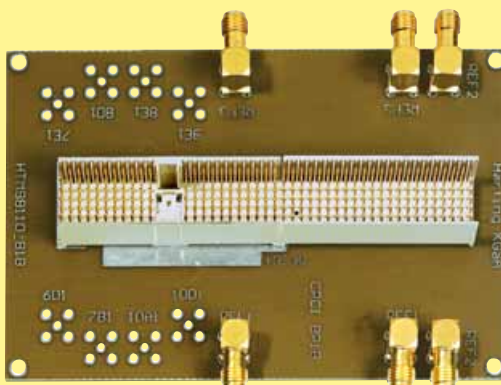


Fig. 5: *har-bus*<sup>®</sup> HM integrated in test board

### Impedance and propagation delay of each connector row

The contacts of the *har-bus<sup>®</sup> HM* and *har-bus<sup>®</sup> HM+* connectors are impedance matched to the 50 Ω environment. This causes less reflections in the application. The following values represent the

characteristics of *har-bus<sup>®</sup> HM* with press-fit termination, the reflow version *har-bus<sup>®</sup> HM+* shows similar values.

Please contact us for more detailed information.

|     | Column |   |   |   |   |
|-----|--------|---|---|---|---|
| Row | 1      | 2 | 3 | 4 | 5 |
| E   | G      | G | G | G | G |
| D   | G      | G | G | G | G |
| C   | G      | G | S | G | G |
| B   | G      | G | G | G | G |
| A   | G      | G | G | G | G |

G = ground  
S = signal

Values for the connector  
from component side  
to component side

Fig. 6: Single ended assignment for the connector, representative shown for the contact C3

|                   | Impedance of the contacts Z [Ω] |      |      |      |      |
|-------------------|---------------------------------|------|------|------|------|
| Rise time tr [ps] | A3                              | B3   | C3   | D3   | E3   |
| 3500              | 50.3                            | 50.3 | 50.4 | 50.4 | 50.6 |
| 1000              | 51.1                            | 51.0 | 51.3 | 51.3 | 52.1 |
| 700               | 51.6                            | 51.5 | 51.8 | 51.9 | 53.0 |
| 500               | 52.3                            | 52.0 | 52.6 | 52.7 | 54.2 |
| 300               | 53.8                            | 53.4 | 54.2 | 54.3 | 56.4 |

Table 1: Impedance of the contacts at different rise times

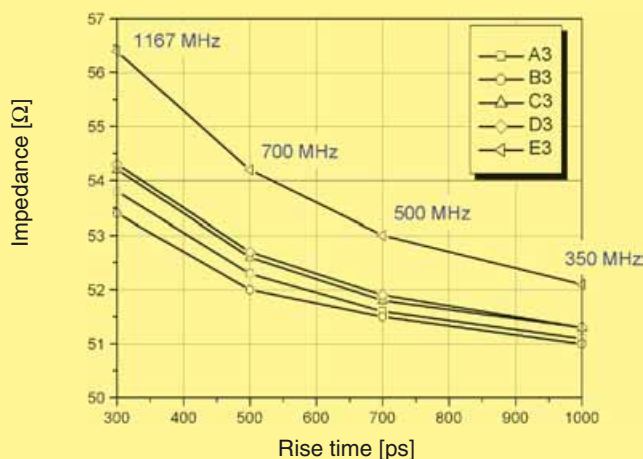


Fig. 7: Influence of the rise time on the impedance

The frequency in the diagram had been calculated with following equation:  $f = \frac{0.35}{\text{rise time}}$

| Contact | Z1 [Ohm] | t <sub>pd1</sub> [ps] | L1 [nH] | C1 [pF] |
|---------|----------|-----------------------|---------|---------|
| A3      | 51.6     | 70                    | 3.61    | 1.36    |
| B3      | 51.5     | 87                    | 4.48    | 1.69    |
| C3      | 51.8     | 97                    | 5.02    | 1.87    |
| D3      | 51.9     | 108                   | 5.61    | 2.08    |
| E3      | 53.0     | 128                   | 6.78    | 2.42    |

Table 2: Propagation delay of each contact of the connector itself

L and C had been calculated with the equations for lossless transmission lines:

$$Z = \sqrt{\frac{L}{C}} \text{ and } t_{pd} = \sqrt{L \cdot C} \Rightarrow L = Z \cdot t_{pd} \text{ and } C = \frac{t_{pd}}{Z}$$

## Return loss of each connector row

Table 3 shows the results of the return loss for each contact at some significant frequencies. The given results in the frequency domain mirror, reflect the behaviour in the time domain.

Due to good impedance matched connectors the return loss is very low.

|     | Column |   |   |   |   |
|-----|--------|---|---|---|---|
| Row | 1      | 2 | 3 | 4 | 5 |
| E   | G      | G | G | G | G |
| D   | G      | G | G | G | G |
| C   | G      | G | S | G | G |
| B   | G      | G | G | G | G |
| A   | G      | G | G | G | G |

G = ground  
S = signal

Values for the connector from component side to component side

Fig. 8: Single ended assignment for the connector, representative shown for the contact C3

|                 | Return loss [dB] |        |        |        |        |
|-----------------|------------------|--------|--------|--------|--------|
| Frequency [MHz] | A3               | B3     | C3     | D3     | E3     |
| 100             | – 42.8           | – 43.8 | – 41.8 | – 41.4 | – 37.4 |
| 300             | – 33.2           | – 34.2 | – 32.2 | – 31.8 | – 27.9 |
| 500             | – 28.8           | – 29.8 | – 27.9 | – 27.5 | – 23.6 |
| 700             | – 25.8           | – 26.9 | – 24.9 | – 24.6 | – 20.7 |
| 1000            | – 22.9           | – 24.0 | – 22.1 | – 21.8 | – 18.0 |
| 2000            | – 17.2           | – 18.5 | – 16.8 | – 16.9 | – 13.7 |
| 3000            | – 13.9           | – 15.6 | – 14.3 | – 15.0 | – 13.0 |

Table 3: Return loss of the contacts at various frequencies

High  
frequency

## Crosstalk for different signal/ground ratios

|     | Column |   |   |   |   |
|-----|--------|---|---|---|---|
| Row | 1      | 2 | 3 | 4 | 5 |
| E   | G      | S | G | S | G |
| D   | S      | G | S | G | S |
| C   | G      | S | G | S | G |
| B   | S      | G | S | G | S |
| A   | G      | S | G | S | G |

Fig. 9: Signal/ground ratio: 1:1

|     | Column |   |   |   |   |
|-----|--------|---|---|---|---|
| Row | 1      | 2 | 3 | 4 | 5 |
| E   | G      | S | G | S | G |
| D   | G      | G | G | G | G |
| C   | G      | S | G | S | G |
| B   | G      | G | G | G | G |
| A   | G      | S | G | S | G |

Fig. 10: Signal/ground ratio: 1:4

|     | Column |   |   |   |   |
|-----|--------|---|---|---|---|
| Row | 1      | 2 | 3 | 4 | 5 |
| E   | G      | G | G | G | G |
| D   | G      | S | G | S | G |
| C   | G      | G | G | G | G |
| B   | G      | S | G | S | G |
| A   | G      | G | G | G | G |

Fig. 11: Signal/ground ratio: 1:6

Figures 9 to 11 show assignments for simulations of crosstalk. Only one contact in these illustrations is connected to the AC source. The voltage at the adjacent contact is detected as ratio to the voltage source in dB.

The more ground contacts surrounding the signal contact, the less crosstalk is detected on the other contacts. The crosstalk of contacts in the same row is less than the crosstalk in the same column. This is due to the fact that the contact itself has not the same thickness in the xy-plane.

## Crosstalk for different signal/ground ratios

### Results for signal/ground ratio of 1:1

| Active line: C2 | Near-end crosstalk [dB] |        |        |        |        |
|-----------------|-------------------------|--------|--------|--------|--------|
| Frequency [MHz] | E2                      | A2     | D3     | B3     | C4     |
| 100             | – 60.6                  | – 64.4 | – 48.5 | – 49.7 | – 68.8 |
| 300             | – 51.1                  | – 54.9 | – 39.2 | – 40.1 | – 59.3 |
| 500             | – 56.9                  | – 50.6 | – 34.9 | – 35.8 | – 55.3 |
| 700             | – 44.2                  | – 47.8 | – 32.1 | – 33.0 | – 52.5 |
| 1000            | – 41.6                  | – 45.1 | – 29.5 | – 30.3 | – 49.8 |

Table 4: Near-end crosstalk of the contacts with a signal/ground ratio of 1:1 at some significant frequencies

| Active line: C2 | Far-end crosstalk [dB] |        |        |        |        |
|-----------------|------------------------|--------|--------|--------|--------|
| Frequency [MHz] | E2                     | A2     | D3     | B3     | C4     |
| 100             | – 73.4                 | – 77.0 | – 68.2 | – 70.2 | – 76.8 |
| 300             | – 64.0                 | – 67.5 | – 59.1 | – 61.1 | – 67.3 |
| 500             | – 60.1                 | – 63.2 | – 56.0 | – 57.6 | – 63.1 |
| 700             | – 57.7                 | – 60.4 | – 55.2 | – 56.3 | – 60.4 |
| 1000            | – 55.8                 | – 57.6 | – 57.5 | – 56.7 | – 57.8 |

Table 5: Far-end crosstalk of the contacts with a signal/ground ratio of 1:1 at some significant frequencies

### Results for signal/ground ratio of 1:4

| Active line: C2 | Near-end crosstalk [dB] |        |        | Far-end crosstalk [dB] |        |        |
|-----------------|-------------------------|--------|--------|------------------------|--------|--------|
| Frequency [MHz] | E2                      | A2     | C4     | E2                     | A2     | C4     |
| 100             | – 62.8                  | – 67.2 | – 74.2 | – 101                  | – 91.4 | – 92.1 |
| 300             | – 53.3                  | – 57.6 | – 64.6 | – 82.2                 | – 80.2 | – 81.6 |
| 500             | – 49.0                  | – 53.3 | – 60.3 | – 73.2                 | – 73.7 | – 75.9 |
| 700             | – 46.1                  | – 50.3 | – 57.3 | – 66.9                 | – 68.6 | – 71.5 |
| 1000            | – 43.4                  | – 47.4 | – 54.4 | – 60.3                 | – 63.1 | – 66.8 |

Table 6: Crosstalk of the contacts with a signal/ground ratio of 1:4 at some significant frequencies

### Results for signal/ground ratio of 1:6

| Active line: B2 | Near-end crosstalk [dB] |        | Far-end crosstalk [dB] |        |
|-----------------|-------------------------|--------|------------------------|--------|
| Frequency [MHz] | B4                      | D2     | B4                     | D2     |
| 100             | – 74.5                  | – 65.4 | – 90.2                 | – 93.5 |
| 300             | – 64.9                  | – 55.9 | – 80.1                 | – 81.1 |
| 500             | – 60.5                  | – 51.5 | – 74.9                 | – 73.7 |
| 700             | – 57.6                  | – 48.6 | – 70.8                 | – 68.1 |
| 1000            | – 54.6                  | – 45.8 | – 66.3                 | – 62.1 |

Table 7: Crosstalk of the contacts with a signal/ground ratio of 1:6 at some significant frequencies

Modern pcb's are fitted with connectors offering SMT- (Surface Mount Technology) or press-in terminations, the preferred option for today's termination technologies. A comparison of both follows:

## Press-in

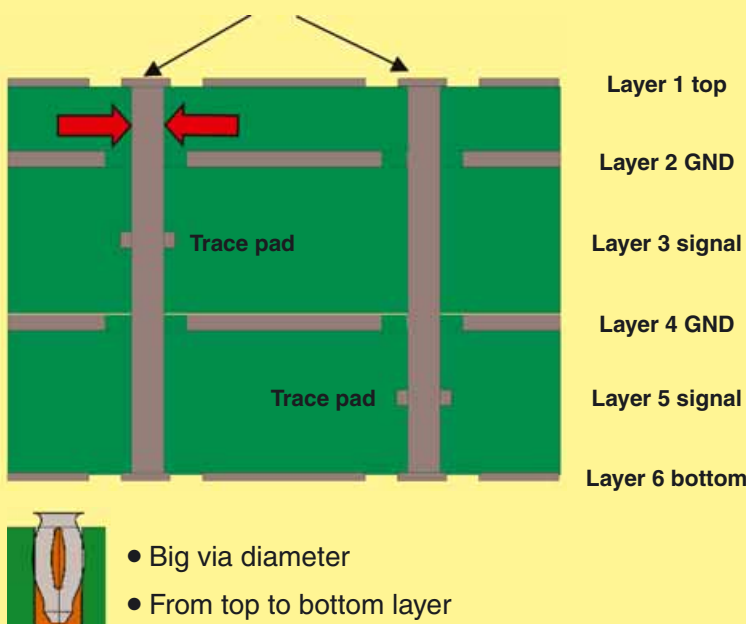
- Plated through holes are necessary  
⇒ Shearing forces during mating are compensated
- No excess flux on the assembled pcb  
⇒ No need of subsequent pcb cleaning
- Prevent thermal shocks associated with soldering  
⇒ Avoids the risk of board malfunction

## SMT

- No plated through holes are necessary for SMT termination  
⇒ Increased space for routing traces
- Small via diameters for signal transmission  
⇒ Positive influence for crosstalk behaviour
- Minimal discontinuity with capacitive nature  
⇒ Less risetime degradation

### Press-in termination

Press-in vias (plated through holes)



### SMT termination

Solder pads with micro vias

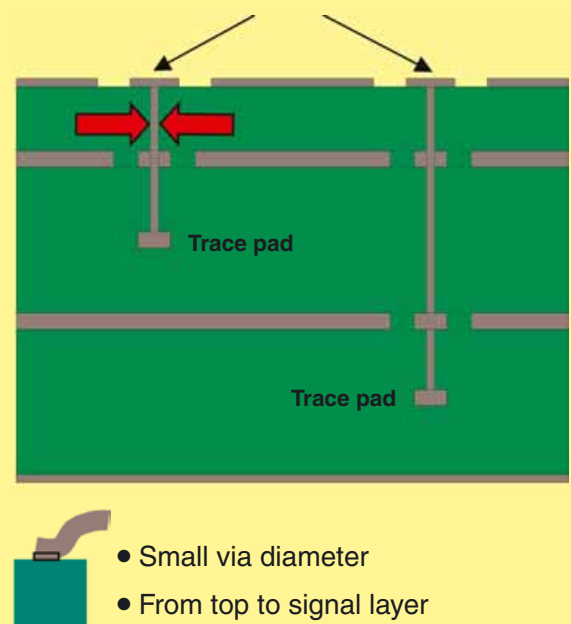


Fig. 12: Press-in termination versus SMT termination

## General information

In comparison to the standard 5-row *har-bus® HM* series, this new 6-row version offers a significantly higher contact density, thus permitting applications where very high contact density is important. Typically, for a signal transmission of 1.5 Gbps it is possible to obtain 7.5 differential pairs per cm of card edge (see figure 1). For a signal transmission of 2.5 Gbps at least 5 differential pairs per cm of card edge can be obtained (see figure 2).

Male and female connectors are both available with 72 or 144 contacts and can be supplied in reel or tube packaging.

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | + | - | G | G | + | - | G | G | + | - | G | G | + | - | G | G | + | - |
| E | G | G | + | - | G | G | + | - | G | G | + | - | G | G | + | - | G | G |
| D | + | - | G | G | + | - | G | G | + | - | G | G | + | - | G | G | + | - |
| C | G | G | + | - | G | G | + | - | G | G | + | - | G | G | + | - | G | G |
| B | + | - | G | G | + | - | G | G | + | - | G | G | + | - | G | G | + | - |
| A | G | G | + | - | G | G | + | - | G | G | + | - | G | G | + | - | G | G |

Figure 1

[illegible]

Figure 2

## Male connectors

Each contact position can be loaded with any of the 12 different contacts lengths shown (see figure 3).

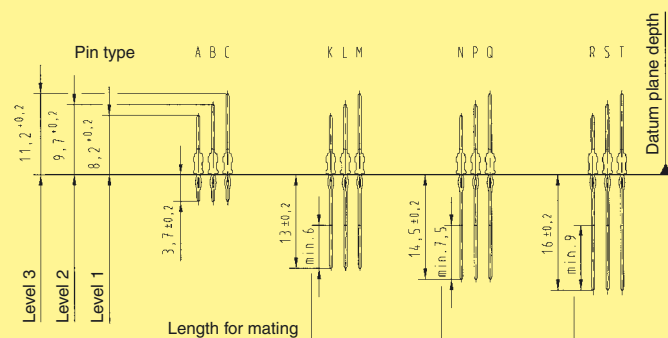
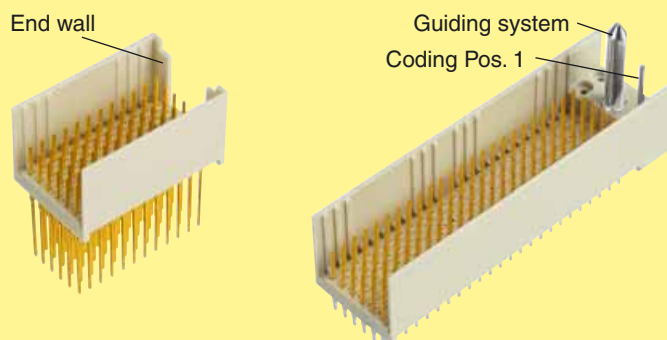


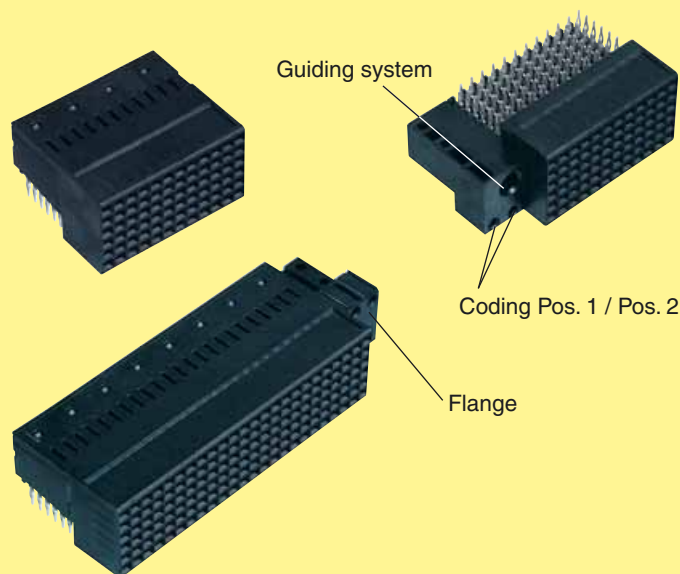
Figure 3

All male connectors can be supplied with end wall, coding pins and guiding system.



## Female connectors with press-in termination

The 6-row female connector needs comparable space on the daughter card as the 5-row versions, as it has similar outer dimensions. Compared to the male connectors, coding pins and a guiding system are available upon request too.



## Female connectors in SMC (Surface Mount Compatible) technology

Using the reflow soldering process, these 6-row female connectors in SMC technology can be soldered to the PCB at the same time as other SMC components. So the handling cost can be reduced significantly and there is no need for a separate press-in process. These connectors are made from a high temperature plastic material that can withstand up to 260°C (lead free soldering). To hold the connector securely on the PCB before the solder process, kinked contacts are offered as standard on both connector sides.

For further information please contact your local HARTING representative.



|                                                              |              |
|--------------------------------------------------------------|--------------|
| <b>har-pak®</b> connector system – general information ..... | <b>09.02</b> |
| Contact arrangements .....                                   | <b>09.03</b> |
| Technical characteristics .....                              | <b>09.04</b> |
| <b>Male connectors</b>                                       |              |
| 1 SU (SU = <b>S</b> ystem <b>U</b> nit = 25 mm) .....        | <b>09.06</b> |
| 2 SU .....                                                   | <b>09.08</b> |
| 2.3 SU .....                                                 | <b>09.10</b> |
| 4 SU .....                                                   | <b>09.12</b> |
| 5.4 SU .....                                                 | <b>09.14</b> |
| 9 SU .....                                                   | <b>09.16</b> |
| 10 SU .....                                                  | <b>09.18</b> |
| <b>Female connectors</b>                                     |              |
| 1 SU (SU = <b>S</b> ystem <b>U</b> nit = 25 mm) .....        | <b>09.20</b> |
| 2 SU .....                                                   | <b>09.21</b> |
| 2.3 SU .....                                                 | <b>09.22</b> |
| 4 SU .....                                                   | <b>09.23</b> |
| 5.4 SU .....                                                 | <b>09.24</b> |
| 9 SU .....                                                   | <b>09.25</b> |
| 10 SU .....                                                  | <b>09.26</b> |
| Universal modules 1 SU .....                                 | <b>09.27</b> |
| Special contacts for universal modules 1 SU .....            | <b>09.28</b> |
| Guiding system .....                                         | <b>09.29</b> |



Future packaging systems for electronic equipment must be able to accommodate highly integrated components and be compatible with modern pcb assembly procedures.

**har-pak<sup>®</sup>** connectors<sup>1)</sup> are an integral part of the electrical and mechanical construction of such systems.

This new development is designed in a three dimensional modular format. Due to CAE/CIM, a flexible and cost effective system is offered to the user, from design stage through to production. All existing and projected future packaging requirements are met by **har-pak<sup>®</sup>**.

Typical requirements of such a connector system are as follow:

- High contact density
- Modular construction designed for state of the art backplane wiring techniques
- Solderless termination techniques

With **har-pak<sup>®</sup>**, an optimum utilisation of space is achieved with no loss of contact pitch when components are joined together. The minimum daughtercard pitch is only 15 mm.

The concept of the **har-pak<sup>®</sup>** packaging system realises a homogeneous continuing pitch. Units of height, width and depth are formed by single modules of 0.5 mm or multi-modules of 2.5 mm (see Fig. 1).

The construction of **har-pak<sup>®</sup>** considers the possibility of combinations with other standardised packaging systems and meets all technical requirements of data communication, medical and process control markets.

**har-pak<sup>®</sup>** connectors are available in sizes 1 SU, 2 SU, 2.3 SU, 4 SU, 5.4 SU, 9 SU and 10 SU according to IEC 61 076-4-100 (SU = System Unit = 25 mm).

The 5 row arrangement with the 10 SU version carries up to 475 contacts in one connector module. Customised designs of this indirect, inverse connector system are available on request.

Male and female connectors accommodate coaxial, high current, first mate contacts and are designed in solderless press-in technique. An optimum screening concept for protection against Electromagnetic Interference (EMI) is achieved by pseudo coaxial contact arrangements.

Male and female connectors offer the following benefits:

### Male connectors

- Precision contacts, including the interface system
- Reliable press-in technology for multilayer pcb's (up to 6.00 mm)<sup>2)</sup>
- Preleading/lagging contacts possible in all positions
- Contact plating for all performance levels
- Press-in contact header with compliant press-in zone

### Female connectors

- Two contact points
- Contacts protected by moulding
- Contact plating for all performance levels
- Different contact loadings possible
- Integrated fixing elements
- Press-in contact with compliant press-in zone

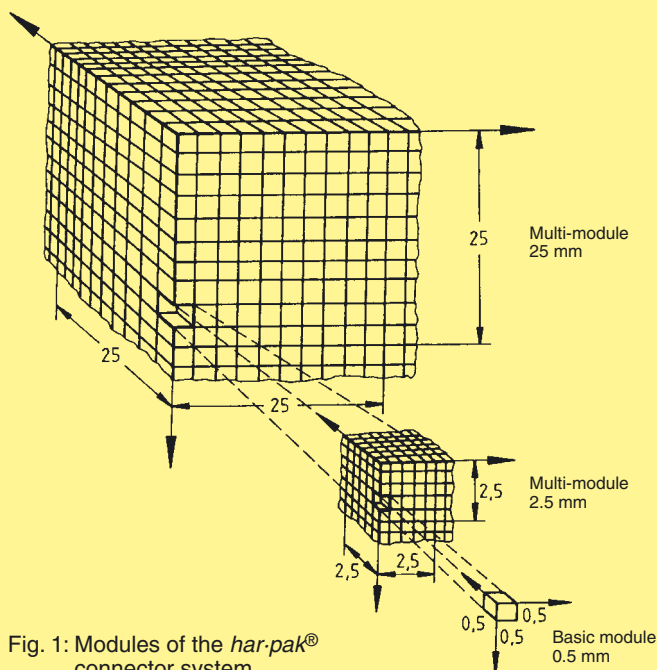


Fig. 1: Modules of the **har-pak<sup>®</sup>** connector system.

<sup>1)</sup> specified acc. to IEC 61 076-4-100 (DIN 41 642, CECC 75 101-807 and others)

<sup>2)</sup> The maximal allowed board thickness depends on several parameters. For boards with more than 4.5 mm please contact us.

| Identification                                                                                                    | Cont.<br>arr. | No. of contacts (SU) |    |     |     |     |     |     | Drawing | Dimensions in mm |
|-------------------------------------------------------------------------------------------------------------------|---------------|----------------------|----|-----|-----|-----|-----|-----|---------|------------------|
|                                                                                                                   |               | 1                    | 2  | 2.3 | 4   | 5.4 | 9   | 10  |         |                  |
| Female connector                                                                                                  | 3             | 12                   | 27 | 30  | 57  | 78  | 132 | 147 |         |                  |
| Male connector                                                                                                    | 7             | 12                   | 27 | 30  | 57  | 78  | 132 | 147 |         |                  |
| Female connector                                                                                                  | 2             | 18                   | 43 | 50  | 93  | 126 | 214 | 239 |         |                  |
| Male connector                                                                                                    | 6             | 18                   | 43 | 50  | 93  | 126 | 214 | 239 |         |                  |
| Female connector                                                                                                  | 8             | 28                   | 68 | 80  | 148 | 200 | 340 | 380 |         |                  |
| Male connector                                                                                                    | 4             | 28                   | 68 | 80  | 148 | 200 | 340 | 380 |         |                  |
| Female connector                                                                                                  | 1             | 35                   | 85 | 100 | 185 | 250 | 425 | 475 |         |                  |
| Male connector                                                                                                    | 1             | 35                   | 85 | 100 | 185 | 250 | 425 | 475 |         |                  |
| <b>Screening of signals</b><br>Examples of pseudo coaxial contact arrangements based on standard contact loadings | 6             |                      |    |     |     |     |     |     |         |                  |
|                                                                                                                   | 4             |                      |    |     |     |     |     |     |         |                  |
|                                                                                                                   | 1             |                      |    |     |     |     |     |     |         |                  |

Signal contact  
 Ground contact

Design according : IEC 61 076 - 4 - 100

Number of contacts : max. 475 at 10 SU

Contact spacing : 2.5 mm  
Clearance and creepage distances:

|              | contact arrangements (see page 09.03) |        |        |        |
|--------------|---------------------------------------|--------|--------|--------|
|              | 7/3                                   | 6/2    | 4/8    | 1      |
| in one row   | 2.9 mm                                | 0.8 mm | 0.8 mm | 0.8 mm |
| between rows | 1.4 mm                                | 0.8 mm | 0.8 mm | 0.6 mm |

Working current : See current carrying capacity chart on page 09.05

Test voltage  $U_{r.m.s.}$  : 1 kV for pitch 2.5 x 2.5 mm  
1.55 kV for pitch 5.0 x 5.0 mm

Contact resistance :  $\leq 20 \text{ m}\Omega$

Insulation resistance:  $\geq 10^{12} \Omega$

Temperature range :  $-55^\circ\text{C} \dots +125^\circ\text{C}$

Durability as per IEC 61076-4-100 : Performance level 2 = 250 mating cycles in total.  
Performance level 1 = 500 mating cycles in total.

Normal force :  $\geq 0.75 \text{ N}$  for performance level 2  
 $\geq 1.0 \text{ N}$  for performance level 1

Insertion force :  $\leq 1.0 \text{ N}$  per contact

Withdrawal force :  $\leq 1.0 \text{ N}$  per contact

Recommended configuration of plated through holes:

|                                                      |             |                             |
|------------------------------------------------------|-------------|-----------------------------|
| <i>Tin-lead plated PCB (HAL) acc. DIN EN 60352-5</i> | Hole        | $1.15 \pm 0.025 \text{ mm}$ |
|                                                      | Cu          | min. $25 \mu\text{m}$       |
|                                                      | Sn          | max. $15 \mu\text{m}$       |
|                                                      | Plated hole | 0.94-1.09 mm                |
| <i>Chemical tin-plated PCB</i>                       | Hole        | $1.15 \pm 0.025 \text{ mm}$ |
|                                                      | Cu          | min. $25 \mu\text{m}$       |
|                                                      | Sn          | min. $0.8 \mu\text{m}$      |
|                                                      | Plated hole | 1.00-1.10 mm                |
| <i>Au / Ni plated PCB</i>                            | Hole        | $1.15 \pm 0.025 \text{ mm}$ |
|                                                      | Cu          | min. $25 \mu\text{m}$       |
|                                                      | Ni          | 3-7 $\mu\text{m}$           |
|                                                      | Au          | 0.05-0.12 $\mu\text{m}$     |
|                                                      | Plated hole | 1.00-1.10 mm                |
| <i>Silver plated PCB</i>                             | Hole        | $1.15 \pm 0.025 \text{ mm}$ |
|                                                      | Cu          | min. $25 \mu\text{m}$       |
|                                                      | Ag          | 0.1-0.3 $\mu\text{m}$       |
|                                                      | Plated hole | 1.00-1.10 mm                |
| <i>OSP copper plated PCB</i>                         | Hole        | $1.15 \pm 0.025 \text{ mm}$ |
|                                                      | Cu          | min. $25 \mu\text{m}$       |
|                                                      | Plated hole | 1.00-1.10 mm                |

PCB board thickness:  $\geq 1.6 \text{ mm}$

Materials

Mouldings : Thermoplastic resin, glass-fibre filled, UL 94-V0

Contacts : Copper alloy

Contact surface\*

Contact zone : Selectively gold-plated

Press-in-zone : Ni

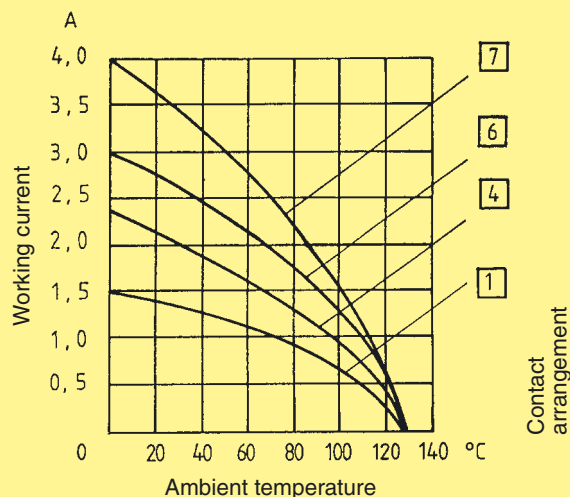
Termination for interfacing : Wrap zone : Ni  
Interface : Au

\* Other contact surfaces on request

### Current carrying capacity

The current carrying capacity is limited by maximum temperature of materials for inserts and contacts including terminals. The current capacity curve is valid for continuous, non interrupted current loaded contacts of connectors when simultaneous power on all contacts is given, without exceeding the maximum temperature.

Control and test procedures according to DIN IEC 60 512



### Inductivity

| Contact arrangement | max. inductivity | max. counter inductivity between two contacts |
|---------------------|------------------|-----------------------------------------------|
| 7/3                 | 26 nH            | 9 nH                                          |
| 6/2                 | 26 nH            | 11 nH                                         |
| 4/1/8               | 28 nH            | 15 nH                                         |

All part numbers shown in this chapter contain the standard mating pin length of 8.45 mm.  
Any customized configuration on request.

### Capacitance

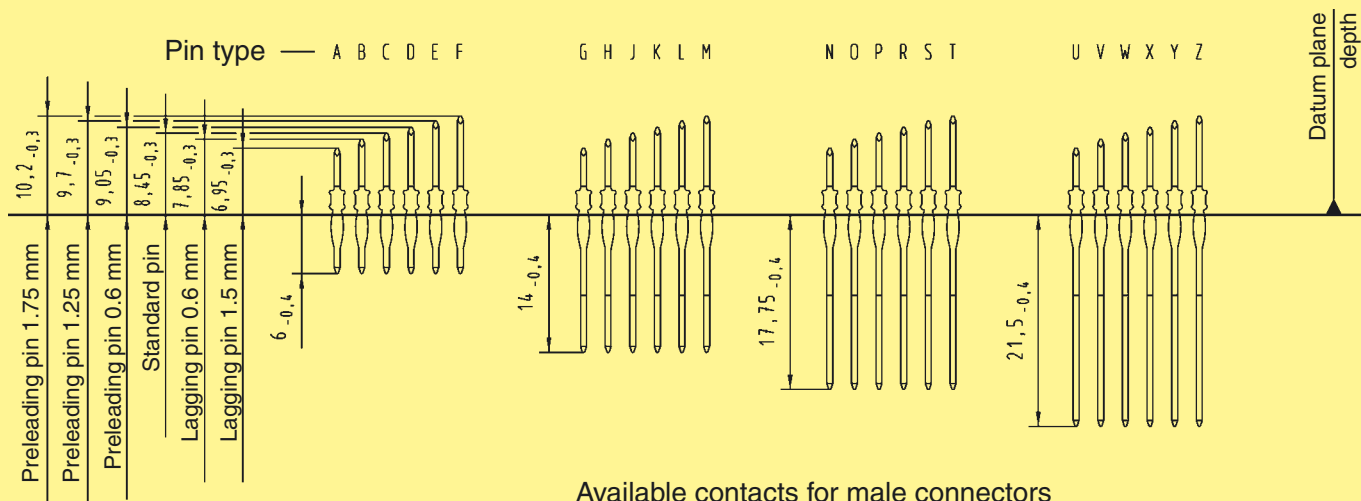
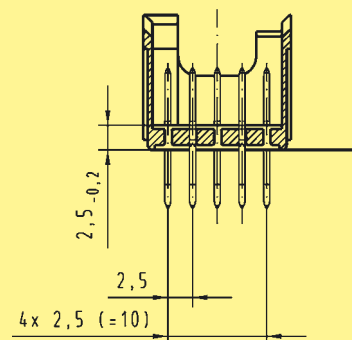
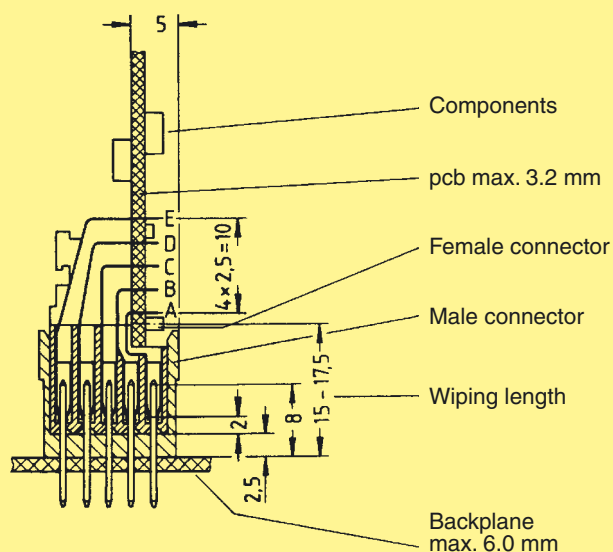
| Contact arrangement | between adjacent contacts |        |        | between surrounding contacts |        |        |
|---------------------|---------------------------|--------|--------|------------------------------|--------|--------|
|                     | K                         | M      | L      | K                            | M      | L      |
| 7/3                 | 0.6 pF                    | 0.7 pF | 0.8 pF | 1.4 pF                       | 1.6 pF | 1.7 pF |
| 6/2                 | 0.7 pF                    | 0.8 pF | 0.9 pF | 1.7 pF                       | 1.9 pF | 2.0 pF |
| 4/1/8               | 1.2 pF                    | 1.3 pF | 1.4 pF | 2.5 pF                       | 2.8 pF | 3.0 pF |

K = Male connector with press-in termination

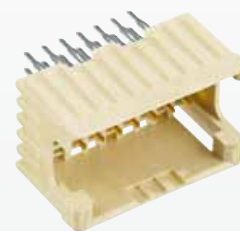
M = Male connector with press-in termination and 2 wraps

L = Male connector with press-in termination and 3 wraps

### Mating conditions as per DIN EN 61 076-4-100



Available contacts for male connectors

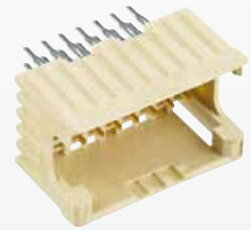


## Male connectors, straight

| Identification                                | Number of contacts | Contact arrangement* | Part number                             |
|-----------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 1 SU male connector with press-in termination | 6.0 mm             | 7                    | 07 01 711 7015<br><b>07 01 711 8015</b> |
|                                               |                    |                      | 07 01 611 7015<br><b>07 01 611 8015</b> |
|                                               |                    |                      | 07 01 411 7015<br><b>07 01 411 8015</b> |
|                                               |                    |                      | 07 01 111 7015<br><b>07 01 111 8015</b> |
|                                               | 14.0 mm            | 7                    | 07 01 712 7015<br><b>07 01 712 8015</b> |
|                                               |                    |                      | 07 01 612 7015<br><b>07 01 612 8015</b> |
|                                               |                    |                      | 07 01 412 7015<br><b>07 01 412 8015</b> |
|                                               |                    |                      | 07 01 112 7015<br><b>07 01 112 8015</b> |
|                                               | 17.75 mm           | 7                    | 07 01 713 7015<br><b>07 01 713 8015</b> |
|                                               |                    |                      | 07 01 613 7015<br><b>07 01 613 8015</b> |
|                                               |                    |                      | 07 01 413 7015<br><b>07 01 413 8015</b> |
|                                               |                    |                      | 07 01 113 7015<br><b>07 01 113 8015</b> |
|                                               | 21.5 mm            | 7                    | 07 01 714 7015<br><b>07 01 714 8015</b> |
|                                               |                    |                      | 07 01 614 7015<br><b>07 01 614 8015</b> |
|                                               |                    |                      | 07 01 414 7015<br><b>07 01 414 8015</b> |
|                                               |                    |                      | 07 01 114 7015<br><b>07 01 114 8015</b> |

\* Contact arrangements see page 09.03

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**

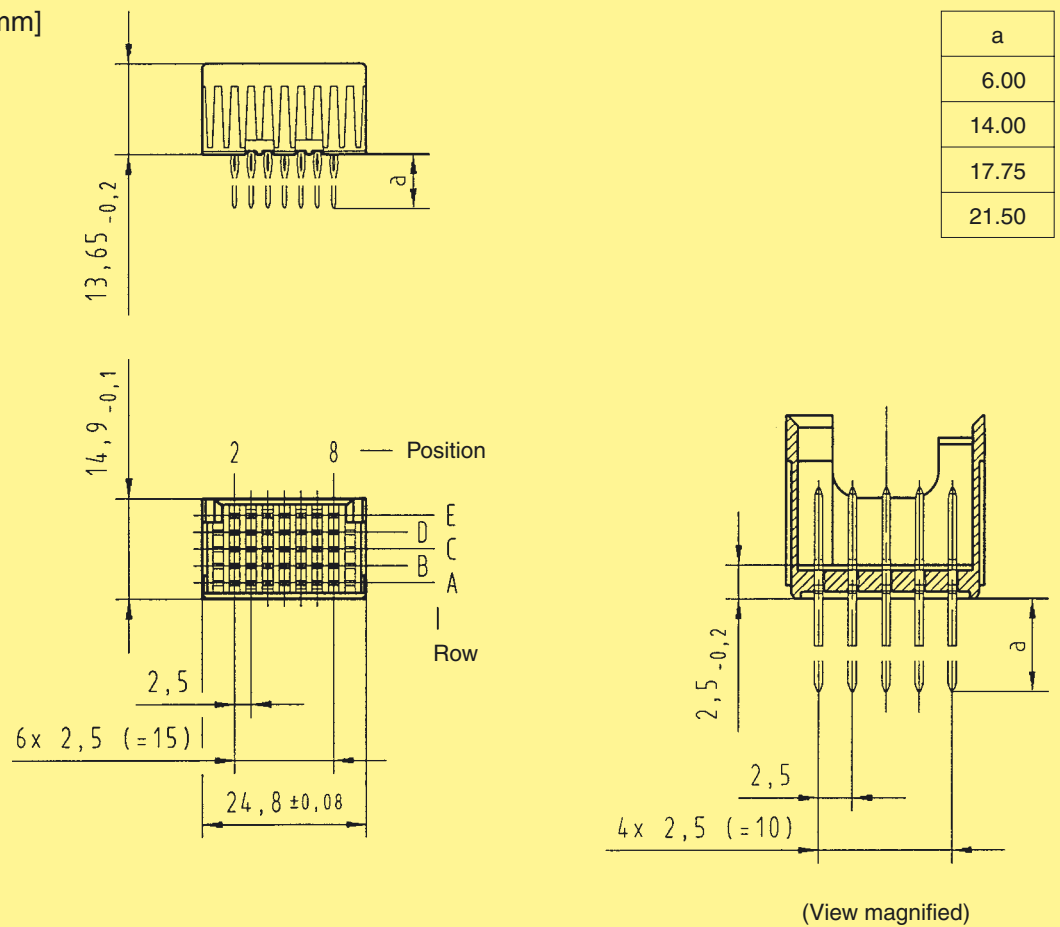


## Male connectors, straight

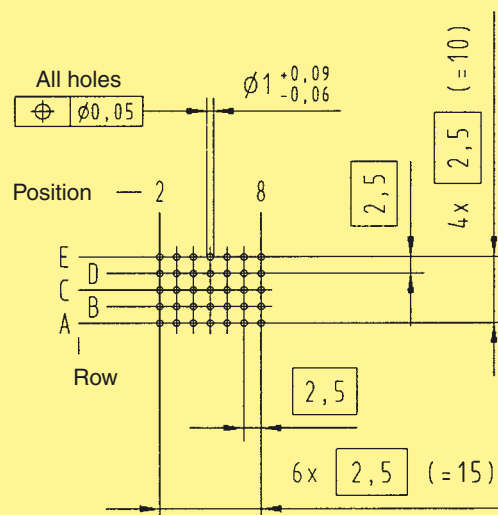
Drawing

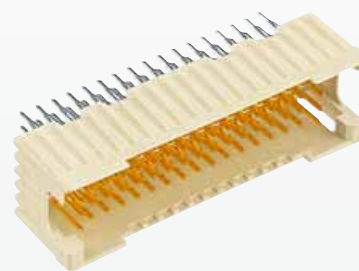
Dimensions in mm

Connector dimensions [mm]



## Board drillings





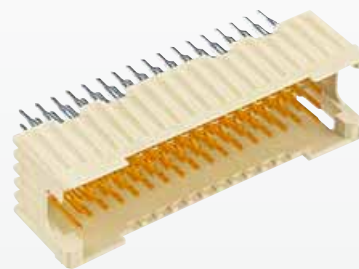
## Male connectors, straight

| Identification                                | Number of contacts | Contact arrangement* | Part number                             |
|-----------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 2 SU male connector with press-in termination | 6.0 mm             | 27                   | 07 02 711 7015<br><b>07 02 711 8015</b> |
|                                               |                    |                      | 07 02 611 7015<br><b>07 02 611 8015</b> |
|                                               |                    |                      | 07 02 411 7015<br><b>07 02 411 8015</b> |
|                                               |                    |                      | 07 02 111 7015<br><b>07 02 111 8015</b> |
|                                               | 14.0 mm            | 27                   | 07 02 712 7015<br><b>07 02 712 8015</b> |
|                                               |                    |                      | 07 02 612 7015<br><b>07 02 612 8015</b> |
|                                               |                    |                      | 07 02 412 7015<br><b>07 02 412 8015</b> |
|                                               |                    |                      | 07 02 112 7015<br><b>07 02 112 8015</b> |
|                                               | 17.75 mm           | 27                   | 07 02 713 7015<br><b>07 02 713 8015</b> |
|                                               |                    |                      | 07 02 613 7015<br><b>07 02 613 8015</b> |
|                                               |                    |                      | 07 02 413 7015<br><b>07 02 413 8015</b> |
|                                               |                    |                      | 07 02 113 7015<br><b>07 02 113 8015</b> |
|                                               | 21.5 mm            | 27                   | 07 02 714 7015<br><b>07 02 714 8015</b> |
|                                               |                    |                      | 07 02 614 7015<br><b>07 02 614 8015</b> |
|                                               |                    |                      | 07 02 414 7015<br><b>07 02 414 8015</b> |
|                                               |                    |                      | 07 02 114 7015<br><b>07 02 114 8015</b> |

\* Contact arrangements see page 09.03

Thin print part numbers: performance level 1  
Bold print part numbers: performance level 2



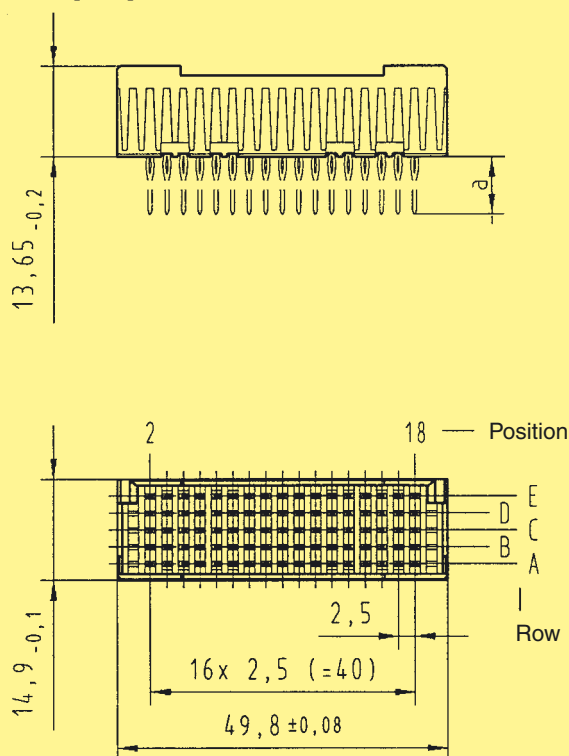


## Male connectors, straight

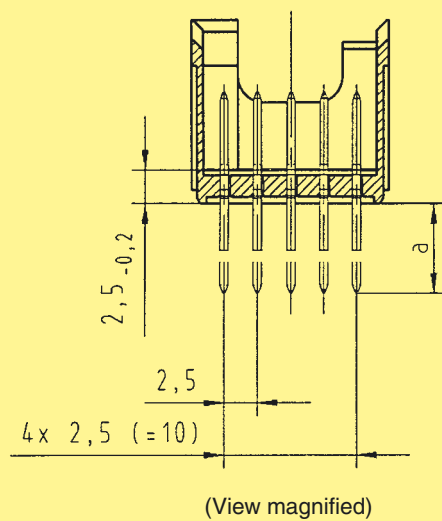
Drawing

Dimensions in mm

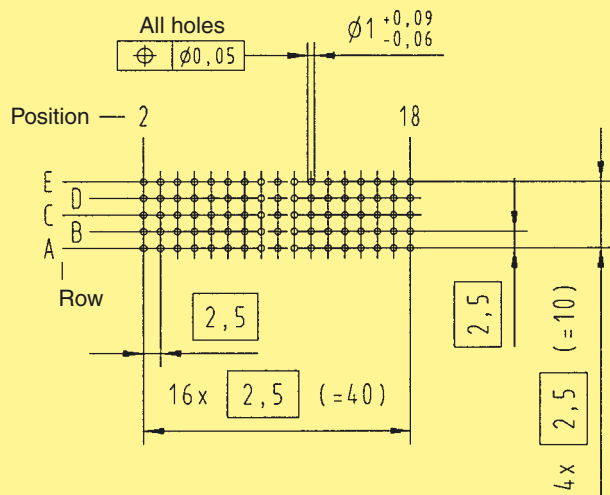
### Connector dimensions [mm]

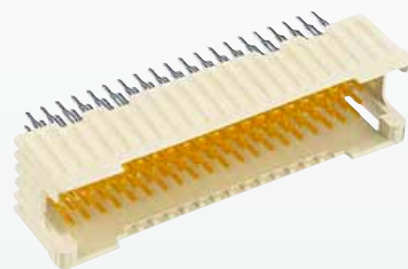


| a     |
|-------|
| 6.00  |
| 14.00 |
| 17.75 |
| 21.50 |



### Board drillings



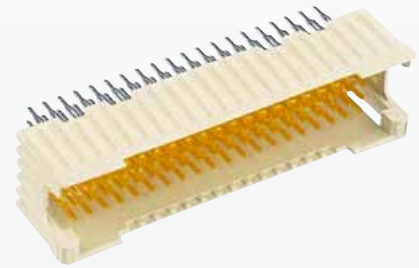


## Male connectors, straight

| Identification                                  | Number of contacts | Contact arrangement* | Part number                             |
|-------------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 2.3 SU male connector with press-in termination | 6.0 mm             | 30                   | 7                                       |
|                                                 |                    |                      | 07 02 711 7016<br><b>07 02 711 8016</b> |
|                                                 |                    |                      | 50                                      |
|                                                 |                    |                      | 07 02 611 7016<br><b>07 02 611 8016</b> |
|                                                 | 8.0 mm             | 4                    | 07 02 411 7017<br><b>07 02 411 8017</b> |
|                                                 |                    |                      | 100                                     |
|                                                 |                    |                      | 07 02 111 7018<br><b>07 02 111 8018</b> |
|                                                 |                    |                      |                                         |
|                                                 | 14.0 mm            | 30                   | 7                                       |
|                                                 |                    |                      | 07 02 712 7016<br><b>07 02 712 8016</b> |
|                                                 |                    |                      | 50                                      |
|                                                 |                    |                      | 07 02 612 7016<br><b>07 02 612 8016</b> |
|                                                 |                    | 4                    | 07 02 412 7016<br><b>07 02 412 8016</b> |
|                                                 |                    |                      | 100                                     |
|                                                 |                    |                      | 07 02 112 7016<br><b>07 02 112 8016</b> |
|                                                 | 17.75 mm           | 30                   | 7                                       |
|                                                 |                    |                      | 07 02 713 7016<br><b>07 02 713 8016</b> |
|                                                 |                    |                      | 50                                      |
|                                                 |                    |                      | 07 02 613 7016<br><b>07 02 613 8016</b> |
|                                                 |                    | 4                    | 07 02 413 7016<br><b>07 02 413 8016</b> |
|                                                 |                    |                      | 100                                     |
|                                                 |                    |                      | 07 02 113 7016<br><b>07 02 113 8016</b> |
|                                                 | 21.5 mm            | 30                   | 7                                       |
|                                                 |                    |                      | 07 02 714 7016<br><b>07 02 714 8016</b> |
|                                                 |                    |                      | 50                                      |
|                                                 |                    |                      | 07 02 614 7016<br><b>07 02 614 8016</b> |
|                                                 |                    | 4                    | 07 02 414 7017<br><b>07 02 414 8017</b> |
|                                                 |                    |                      | 100                                     |
|                                                 |                    |                      | 07 02 114 7017<br><b>07 02 114 8017</b> |

\* Contact arrangements see page 09.03

Thin print part numbers: performance level 1  
Bold print part numbers: performance level 2

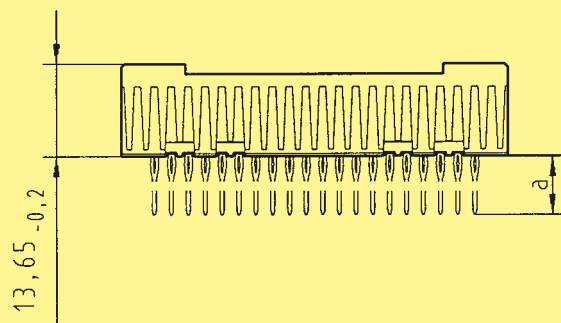


## Male connectors, straight

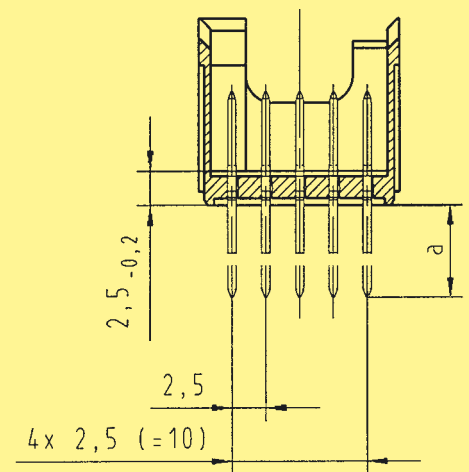
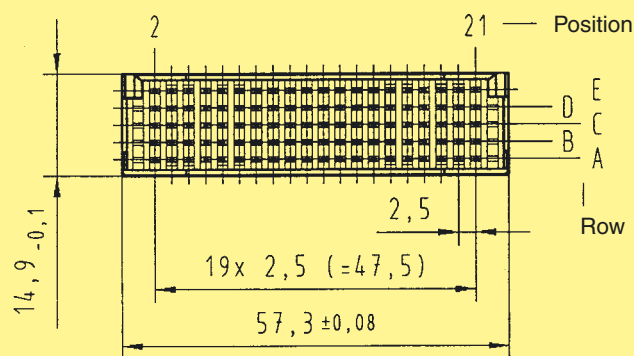
Drawing

Dimensions in mm

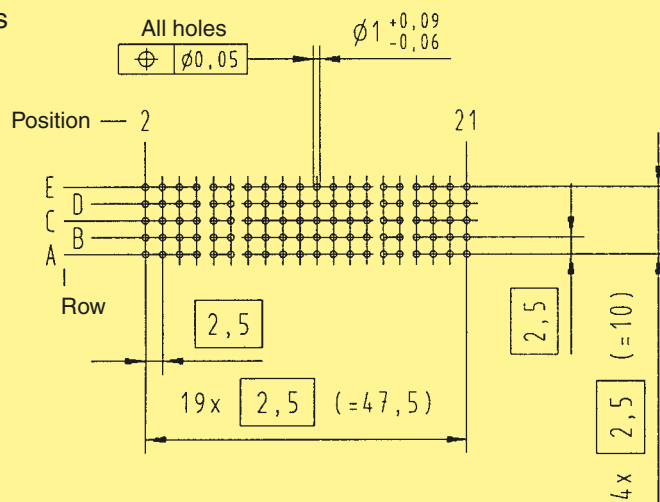
Connector dimensions [mm]

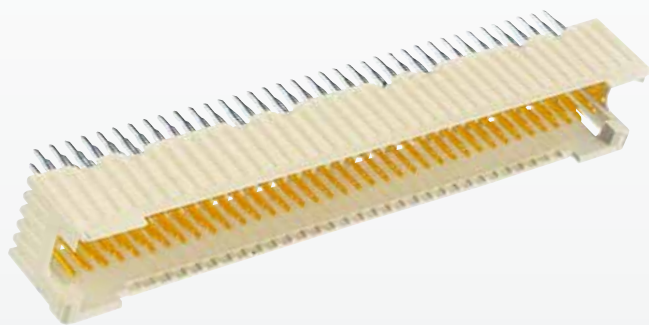


| a     |
|-------|
| 6.00  |
| 14.00 |
| 17.75 |
| 21.50 |



## Board drillings



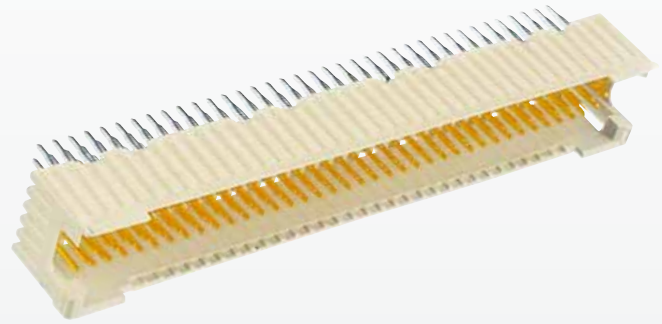


## Male connectors, straight

| Identification                                | Number of contacts | Contact arrangement* | Part number                             |
|-----------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 4 SU male connector with press-in termination | 6.0 mm             | 7                    | 07 04 711 7015<br><b>07 04 711 8015</b> |
|                                               |                    |                      | 07 04 611 7015<br><b>07 04 611 8015</b> |
|                                               |                    |                      | 07 04 411 7015<br><b>07 04 411 8015</b> |
|                                               |                    |                      | 07 04 111 7015<br><b>07 04 111 8015</b> |
|                                               | 14.0 mm            | 7                    | 07 04 712 7015<br><b>07 04 712 8015</b> |
|                                               |                    |                      | 07 04 612 7015<br><b>07 04 612 8015</b> |
|                                               |                    |                      | 07 04 412 7015<br><b>07 04 412 8015</b> |
|                                               |                    |                      | 07 04 112 7015<br><b>07 04 112 8015</b> |
|                                               | 17.75 mm           | 7                    | 07 04 713 7015<br><b>07 04 713 8015</b> |
|                                               |                    |                      | 07 04 613 7015<br><b>07 04 613 8015</b> |
|                                               |                    |                      | 07 04 413 7015<br><b>07 04 413 8015</b> |
|                                               |                    |                      | 07 04 113 7015<br><b>07 04 113 8015</b> |
|                                               | 21.5 mm            | 7                    | 07 04 714 7015<br><b>07 04 714 8015</b> |
|                                               |                    |                      | 07 04 614 7015<br><b>07 04 614 8015</b> |
|                                               |                    |                      | 07 04 414 7015<br><b>07 04 414 8015</b> |
|                                               |                    |                      | 07 04 114 7015<br><b>07 04 114 8015</b> |

\* Contact arrangements see page 09.03

Thin print part numbers: performance level 1  
Bold print part numbers: performance level 2



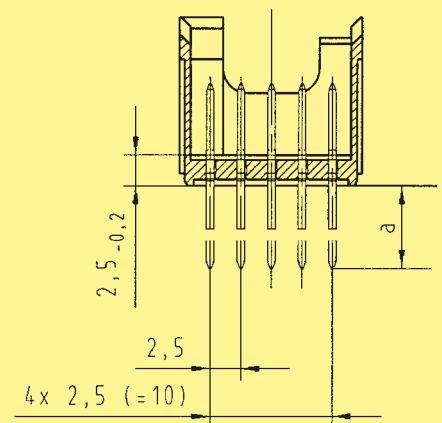
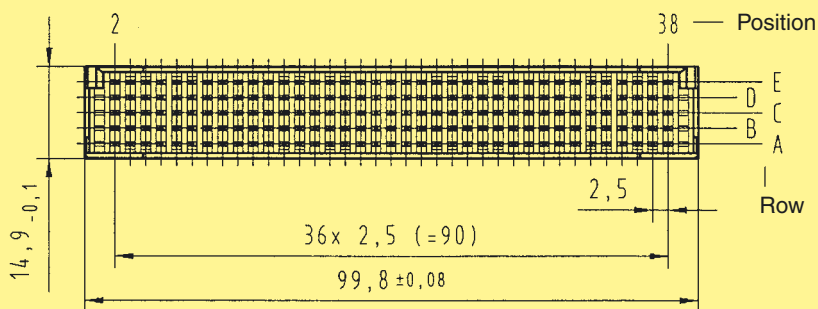
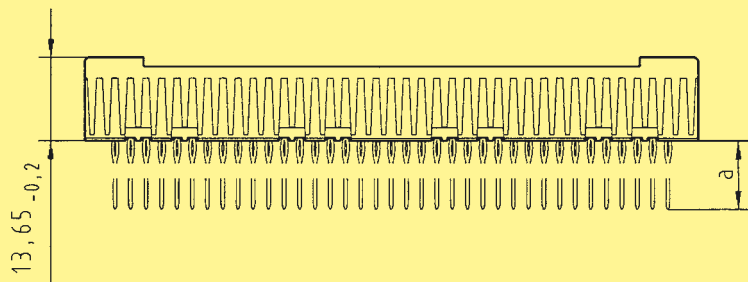
## Male connectors, straight

Drawing

Dimensions in mm

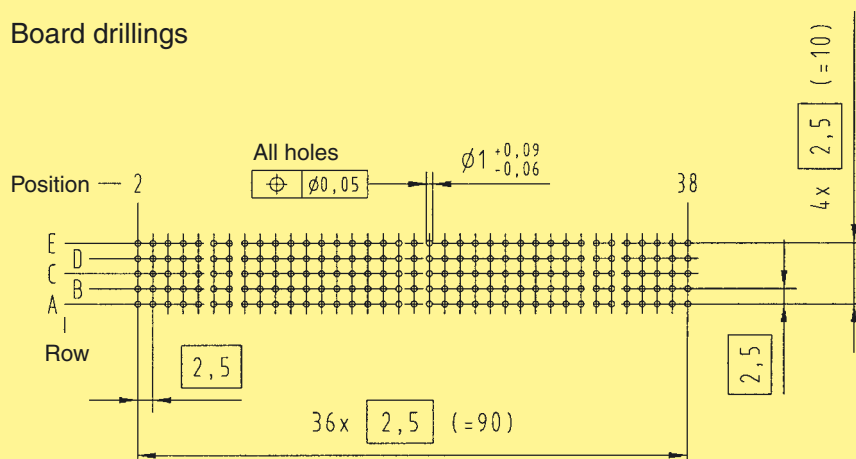
### Connector dimensions [mm]

| a     |
|-------|
| 6.00  |
| 14.00 |
| 17.75 |
| 21.50 |



(View magnified)

### Board drillings



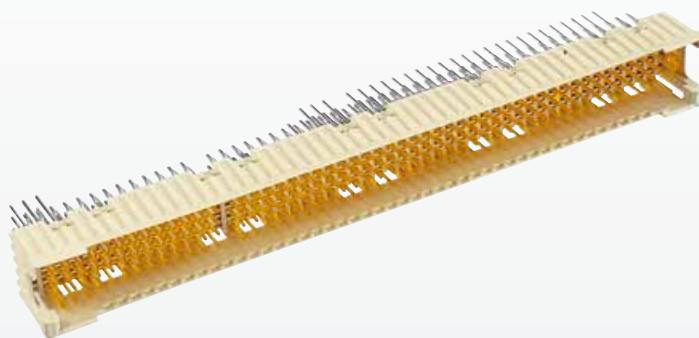


## Male connectors, straight

| Identification                                  | Number of contacts | Contact arrangement* | Part number                             |
|-------------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 5.4 SU male connector with press-in termination | 6.0 mm             | 78                   | 7                                       |
|                                                 |                    |                      | 07 05 711 7015<br><b>07 05 711 8015</b> |
|                                                 |                    |                      | 126                                     |
|                                                 |                    |                      | 6                                       |
|                                                 | 14.0 mm            | 200                  | 4                                       |
|                                                 |                    |                      | 07 05 611 7015<br><b>07 05 611 8015</b> |
|                                                 |                    |                      | 250                                     |
|                                                 |                    |                      | 1                                       |
|                                                 | 17.75 mm           | 78                   | 7                                       |
|                                                 |                    |                      | 07 05 712 7015<br><b>07 05 712 8015</b> |
|                                                 |                    |                      | 126                                     |
|                                                 |                    |                      | 6                                       |
|                                                 | 21.5 mm            | 200                  | 4                                       |
|                                                 |                    |                      | 07 05 612 7015<br><b>07 05 612 8015</b> |
|                                                 |                    |                      | 250                                     |
|                                                 |                    |                      | 1                                       |
|                                                 | 21.5 mm            | 78                   | 7                                       |
|                                                 |                    |                      | 07 05 713 7015<br><b>07 05 713 8015</b> |
|                                                 |                    |                      | 126                                     |
|                                                 |                    |                      | 6                                       |
|                                                 | 21.5 mm            | 200                  | 4                                       |
|                                                 |                    |                      | 07 05 613 7015<br><b>07 05 613 8015</b> |
|                                                 |                    |                      | 250                                     |
|                                                 |                    |                      | 1                                       |
|                                                 | 21.5 mm            | 78                   | 7                                       |
|                                                 |                    |                      | 07 05 714 7015<br><b>07 05 714 8015</b> |
|                                                 |                    |                      | 126                                     |
|                                                 |                    |                      | 6                                       |
|                                                 | 21.5 mm            | 200                  | 4                                       |
|                                                 |                    |                      | 07 05 614 7015<br><b>07 05 614 8015</b> |
|                                                 |                    |                      | 250                                     |
|                                                 |                    |                      | 1                                       |
|                                                 | 21.5 mm            | 78                   | 7                                       |
|                                                 |                    |                      | 07 05 715 7015<br><b>07 05 715 8015</b> |
|                                                 |                    |                      | 126                                     |
|                                                 |                    |                      | 6                                       |
|                                                 | 21.5 mm            | 200                  | 4                                       |
|                                                 |                    |                      | 07 05 615 7015<br><b>07 05 615 8015</b> |
|                                                 |                    |                      | 250                                     |
|                                                 |                    |                      | 1                                       |

\* Contact arrangements see page 09.03

Thin print part numbers: performance level 1  
Bold print part numbers: performance level 2



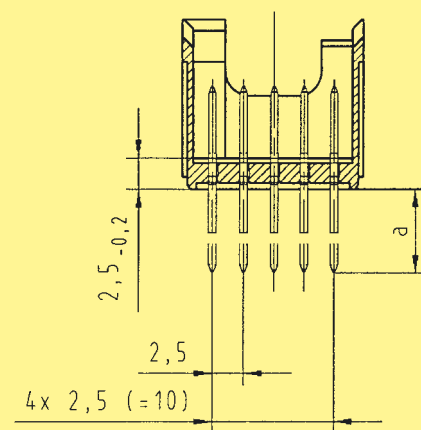
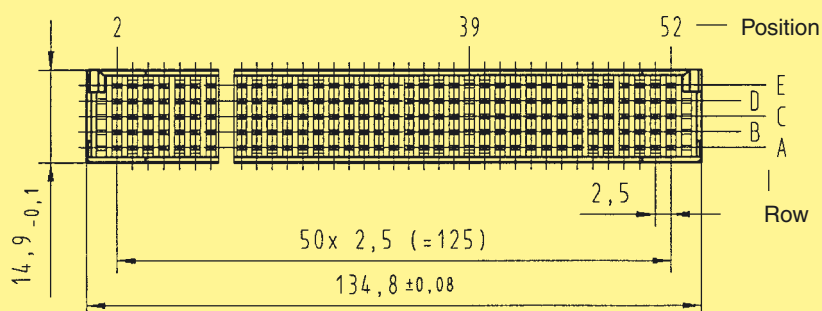
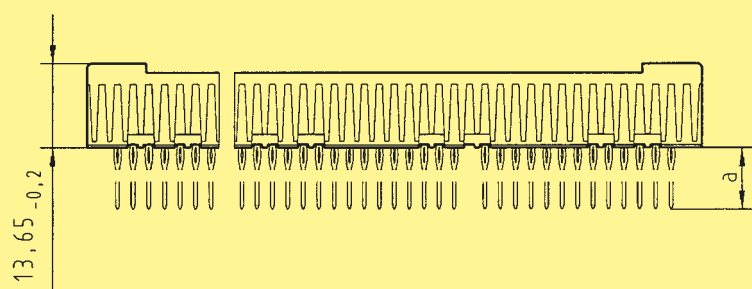
## Male connectors, straight

Drawing

Dimensions in mm

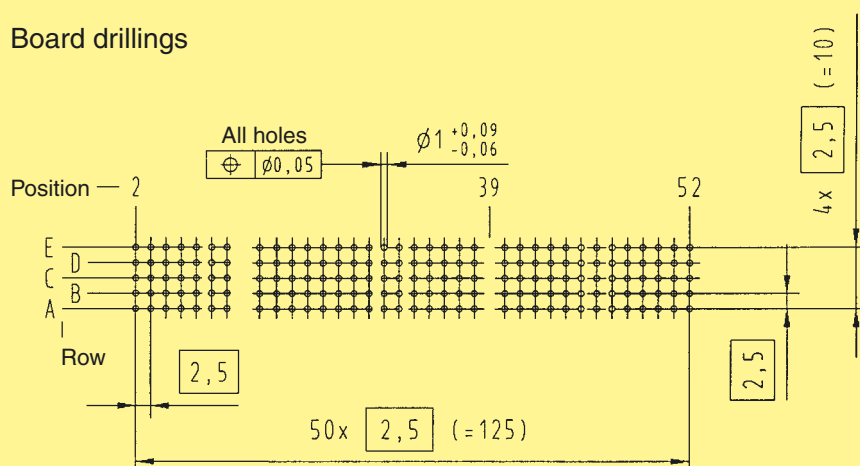
### Connector dimensions [mm]

| a     |
|-------|
| 6.00  |
| 14.00 |
| 17.75 |
| 21.50 |



(View magnified)

### Board drillings





Male connectors,  
straight

| Identification                                | Number of contacts | Contact arrangement* | Part number                             |
|-----------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 9 SU male connector with press-in termination | 6.0 mm             | 7                    | 07 09 711 7015<br><b>07 09 711 8015</b> |
|                                               |                    |                      | 07 09 611 7015<br><b>07 09 611 8015</b> |
|                                               |                    |                      | 07 09 411 7015<br><b>07 09 411 8015</b> |
|                                               |                    |                      | 07 09 111 7015<br><b>07 09 111 8015</b> |
|                                               |                    |                      |                                         |
|                                               | 14.0 mm            | 7                    | 07 09 712 7015<br><b>07 09 712 8015</b> |
|                                               |                    |                      | 07 09 612 7015<br><b>07 09 612 8015</b> |
|                                               |                    |                      | 07 09 412 7015<br><b>07 09 412 8015</b> |
|                                               |                    |                      | 07 09 112 7015<br><b>07 09 112 8015</b> |
|                                               |                    |                      |                                         |
|                                               | 17.75 mm           | 7                    | 07 09 713 7015<br><b>07 09 713 8015</b> |
|                                               |                    |                      | 07 09 613 7015<br><b>07 09 613 8015</b> |
|                                               |                    |                      | 07 09 413 7015<br><b>07 09 413 8015</b> |
|                                               |                    |                      | 07 09 113 7015<br><b>07 09 113 8015</b> |
|                                               |                    |                      |                                         |
|                                               | 21.5 mm            | 7                    | 07 09 714 7015<br><b>07 09 714 8015</b> |
|                                               |                    |                      | 07 09 614 7015<br><b>07 09 614 8015</b> |
|                                               |                    |                      | 07 09 414 7015<br><b>07 09 414 8015</b> |
|                                               |                    |                      | 07 09 114 7015<br><b>07 09 114 8015</b> |
|                                               |                    |                      |                                         |

\* Contact arrangements see page 09.03

Thin print part numbers: performance level 1  
Bold print part numbers: performance level 2

# Male connectors, straight

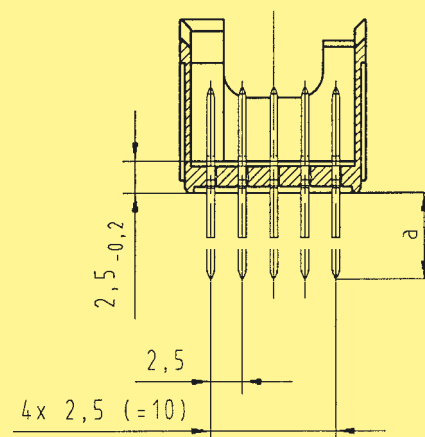
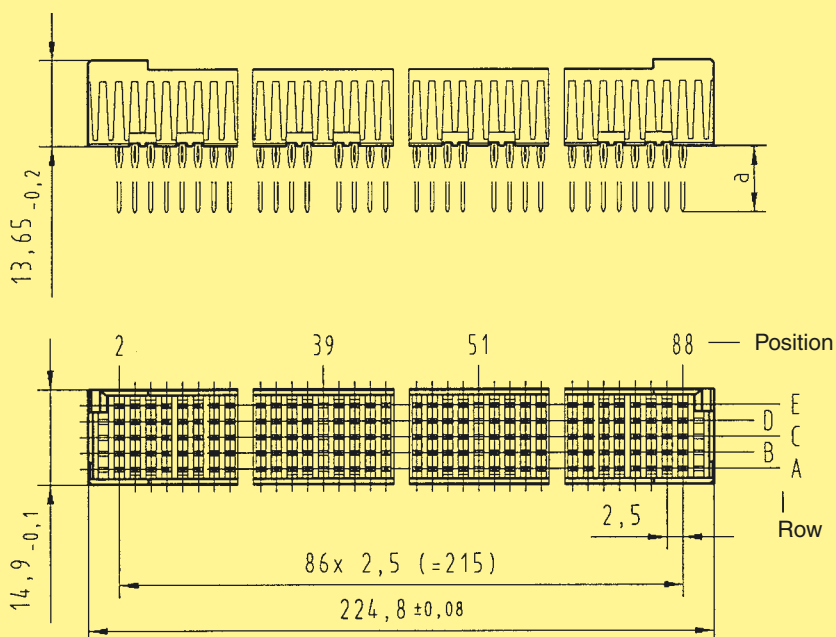


Drawing

Dimensions in mm

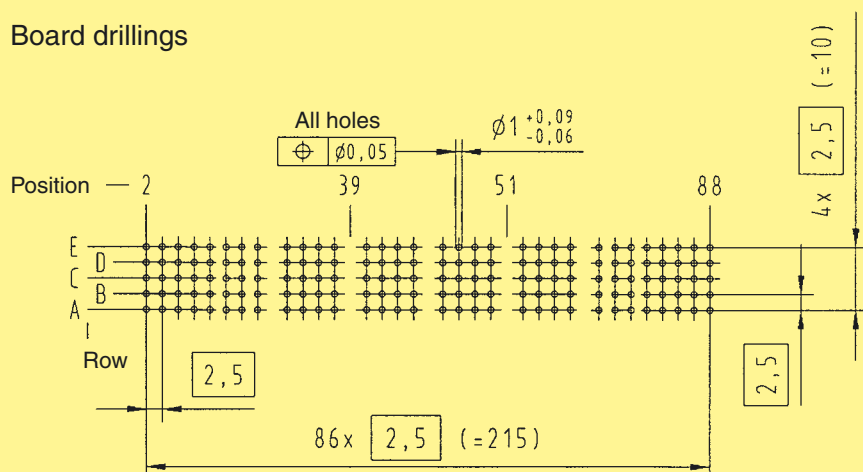
## Connector dimensions [mm]

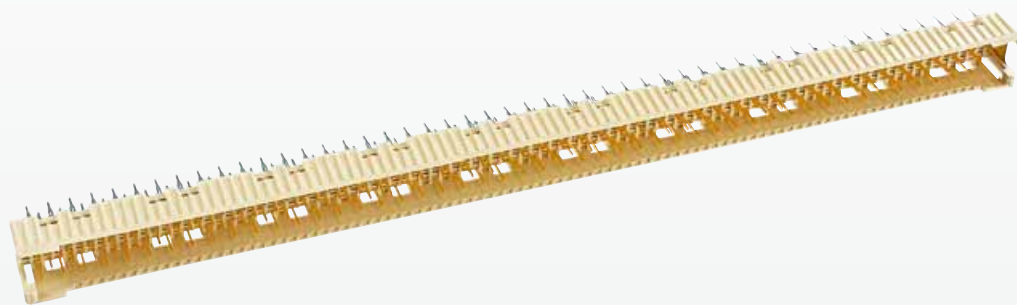
| a     |
|-------|
| 6.00  |
| 14.00 |
| 17.75 |
| 21.50 |



(View magnified)

## Board drillings

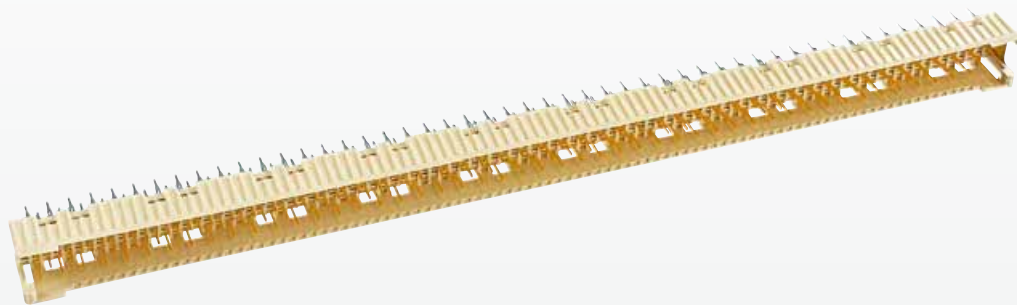


Male connectors,  
straight

| Identification                                 | Number of contacts | Contact arrangement* | Part number                             |
|------------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 10 SU male connector with press-in termination | 6.0 mm             | 7                    | 07 00 711 7015<br><b>07 00 711 8015</b> |
|                                                |                    |                      | 07 00 611 7015<br><b>07 00 611 8015</b> |
|                                                |                    |                      | 07 00 411 7015<br><b>07 00 411 8015</b> |
|                                                |                    |                      | 07 00 111 7015<br><b>07 00 111 8015</b> |
|                                                | 14.0 mm            | 7                    | 07 00 712 7015<br><b>07 00 712 8015</b> |
|                                                |                    |                      | 07 00 612 7015<br><b>07 00 612 8015</b> |
|                                                |                    |                      | 07 00 412 7015<br><b>07 00 412 8015</b> |
|                                                |                    |                      | 07 00 112 7015<br><b>07 00 112 8015</b> |
|                                                | 17.75 mm           | 7                    | 07 00 713 7015<br><b>07 00 713 8015</b> |
|                                                |                    |                      | 07 00 613 7015<br><b>07 00 613 8015</b> |
|                                                |                    |                      | 07 00 413 7015<br><b>07 00 413 8015</b> |
|                                                |                    |                      | 07 00 113 7015<br><b>07 00 113 8015</b> |
|                                                | 21.5 mm            | 7                    | 07 00 714 7015<br><b>07 00 714 8015</b> |
|                                                |                    |                      | 07 00 614 7015<br><b>07 00 614 8015</b> |
|                                                |                    |                      | 07 00 414 7015<br><b>07 00 414 8015</b> |
|                                                |                    |                      | 07 00 114 7016<br><b>07 00 114 8016</b> |

\* Contact arrangements see page 09.03

Thin print part numbers: performance level 1  
Bold print part numbers: performance level 2



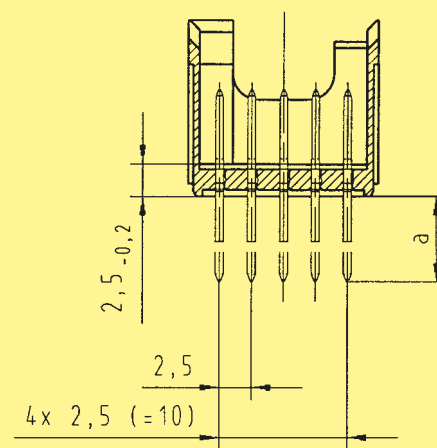
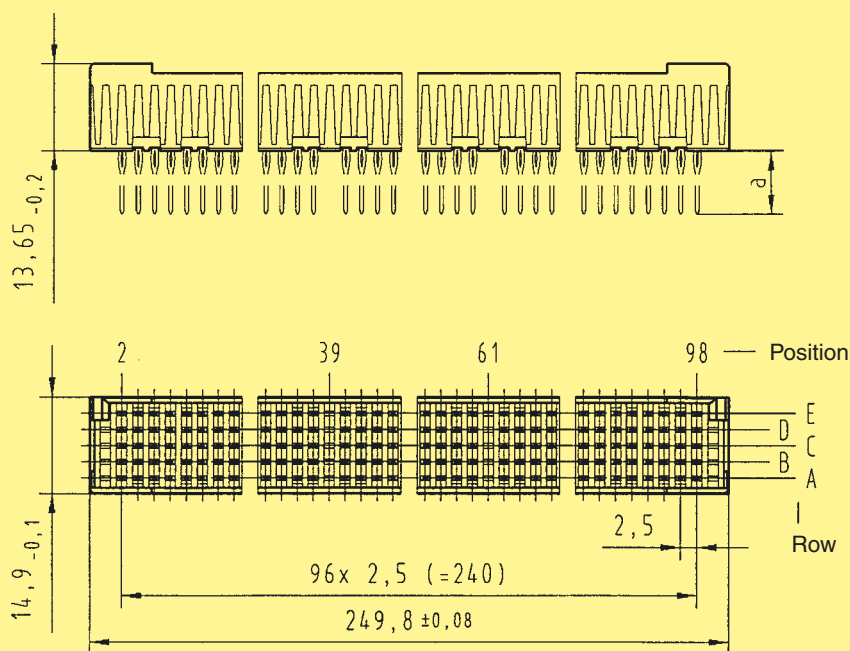
## Male connectors, straight

Drawing

Dimensions in mm

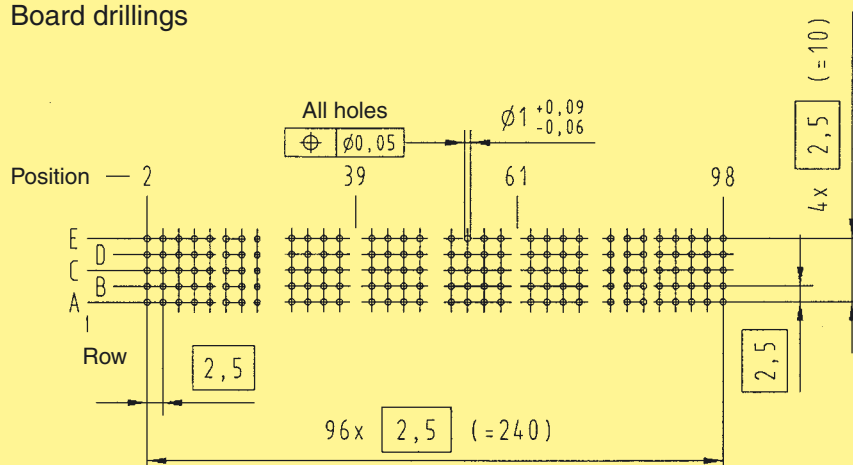
### Connector dimensions [mm]

| a     |
|-------|
| 6.00  |
| 14.00 |
| 17.75 |
| 21.50 |



(View magnified)

### Board drillings

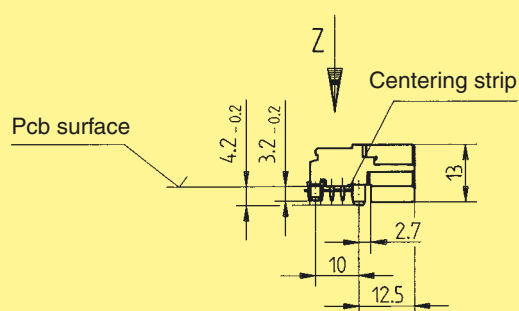
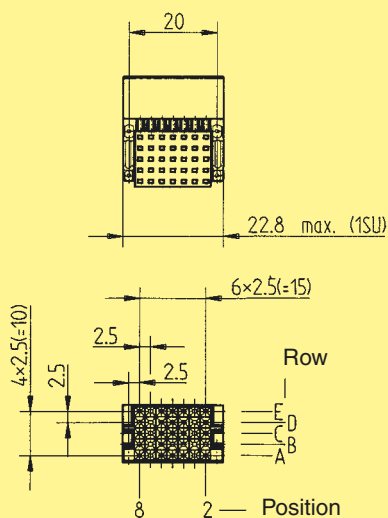




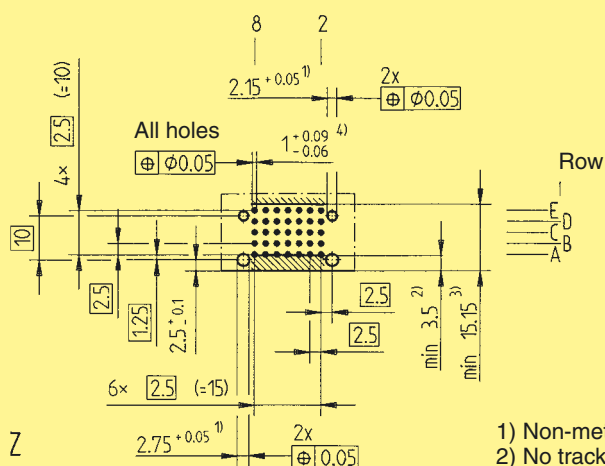
## Female connectors, angled

| Identification                                  | Number of contacts | Contact arrangement* | Part number                             |
|-------------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 1 SU female connector with press-in termination | 12                 | 3                    | 07 21 319 7015<br><b>07 21 319 8015</b> |
|                                                 | 18                 | 2                    | 07 21 219 7015<br><b>07 21 219 8015</b> |
|                                                 | 28                 | 8                    | 07 21 819 7015<br><b>07 21 819 8015</b> |
|                                                 | 35                 | 1                    | 07 21 119 7015<br><b>07 21 119 8015</b> |

### Connector dimensions [mm]



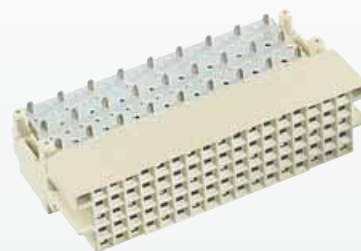
Board drillings  
(revolved by 90°)



- 1) Non-metallised drillings
- 2) No tracks, except solder eyes
- 3) Limit area of components (valid for both pcb-sides)
- 4) For press-in connection DIN EN 60 352-5

\* Contact arrangements see page 09.03

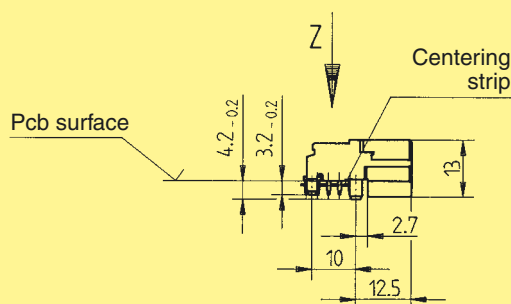
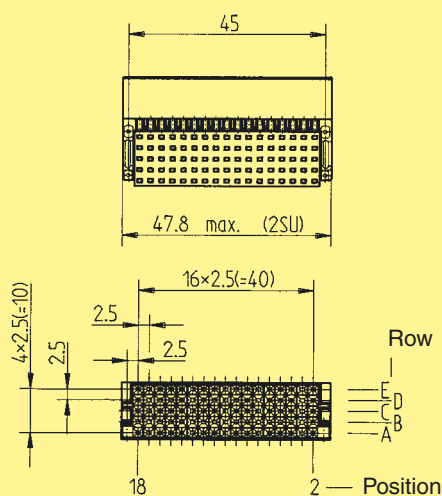
Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**



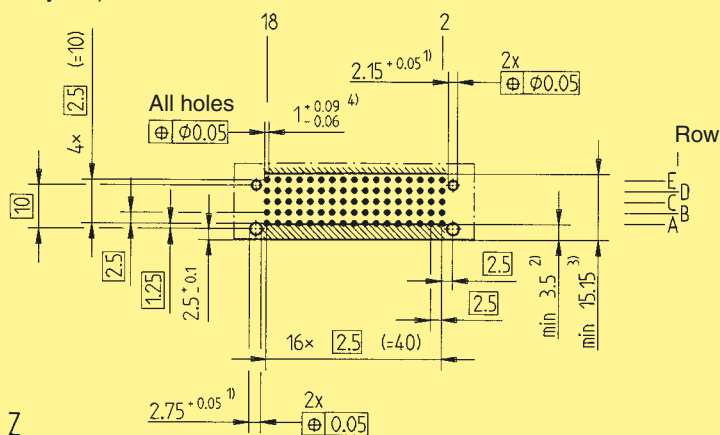
## Female connectors, angled

| Identification                                  | Number of contacts | Contact arrangement* | Part number                             |
|-------------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 2 SU female connector with press-in termination | 27                 | 3                    | 07 22 319 7015<br><b>07 22 319 8015</b> |
|                                                 | 43                 | 2                    | 07 22 219 7015<br><b>07 22 219 8015</b> |
|                                                 | 68                 | 8                    | 07 22 819 7015<br><b>07 22 819 8015</b> |
|                                                 | 85                 | 1                    | 07 22 119 7015<br><b>07 22 119 8015</b> |

### Connector dimensions [mm]



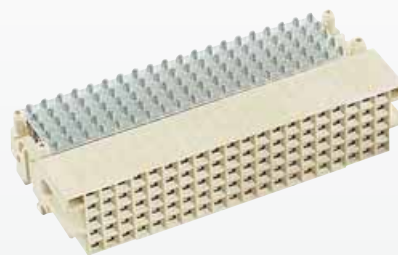
Board drillings  
(revolved by 90°)



- 1) Non-metallised drillings
- 2) No tracks, except solder eyes
- 3) Limit area of components (valid for both pcb-sides)
- 4) For press-in connection DIN EN 60 352-5

\* Contact arrangements see page 09.03

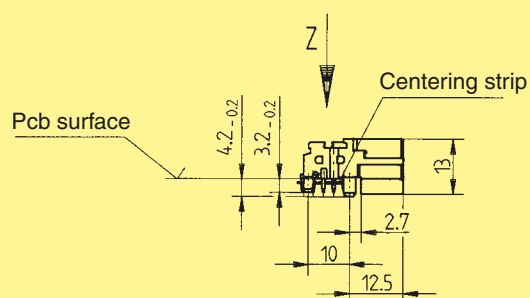
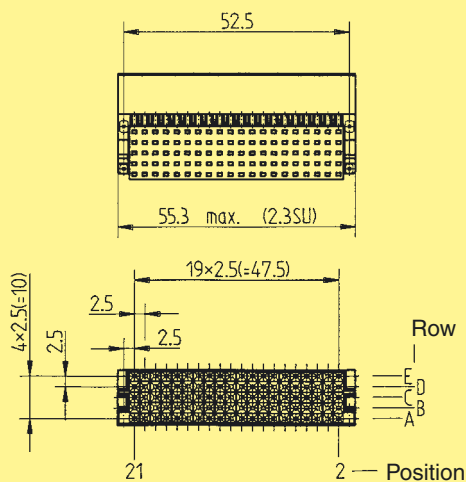
Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**



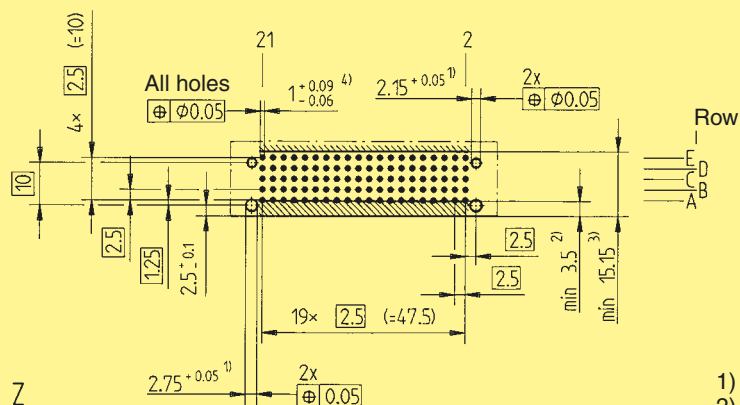
## Female connectors, angled

| Identification                                    | Number of contacts | Contact arrangement* | Part number                             |
|---------------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 2.3 SU female connector with press-in termination | 30                 | 3                    | 07 22 319 7016<br><b>07 22 319 8016</b> |
|                                                   | 50                 | 2                    | 07 22 219 7016<br><b>07 22 219 8016</b> |
|                                                   | 80                 | 8                    | 07 22 819 7016<br><b>07 22 819 8016</b> |
|                                                   | 100                | 1                    | 07 22 119 7016<br><b>07 22 119 8016</b> |

## Connector dimensions [mm]



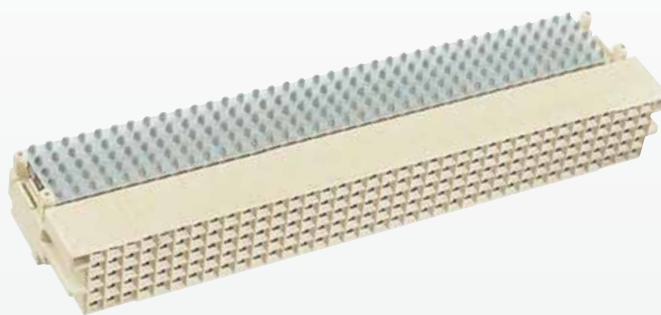
## Board drillings (revolved by 90°)



- 1) Non-metallised drillings
- 2) No tracks, except solder eyes
- 3) Limit area of components (valid for both pcb-sides)
- 4) For press-in connection DIN EN 60 352-5

\* Contact arrangements see page 09.03

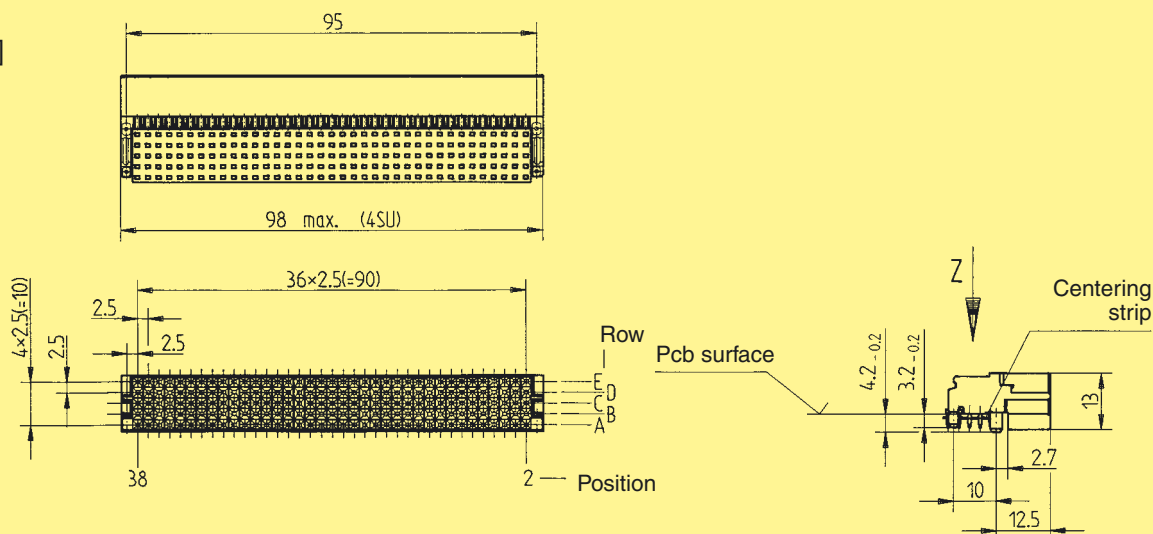




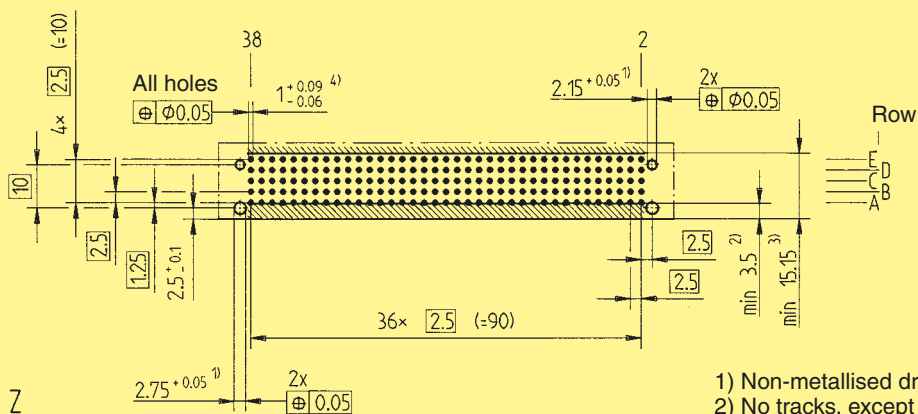
### Female connectors, angled

| Identification                                  | Number of contacts | Contact arrangement* | Part number                             |
|-------------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 4 SU female connector with press-in termination | 57                 | 3                    | 07 24 319 7015<br><b>07 24 319 8015</b> |
|                                                 | 93                 | 2                    | 07 24 219 7015<br><b>07 24 219 8015</b> |
|                                                 | 148                | 8                    | 07 24 819 7015<br><b>07 24 819 8015</b> |
|                                                 | 185                | 1                    | 07 24 119 7015<br><b>07 24 119 8015</b> |

### Connector dimensions [mm]

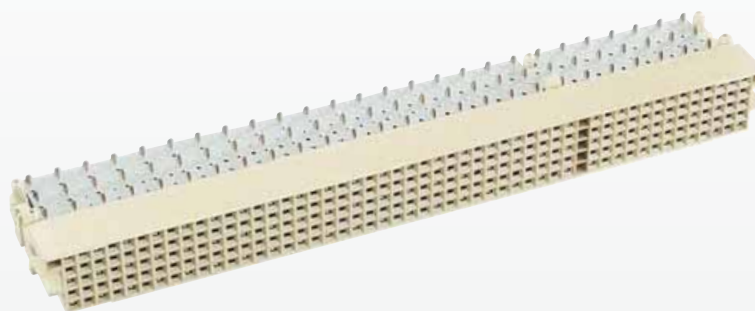


### Board drillings (revolved by 90°)



\* Contact arrangements see page 09.03

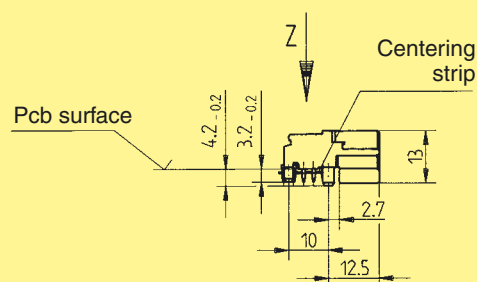
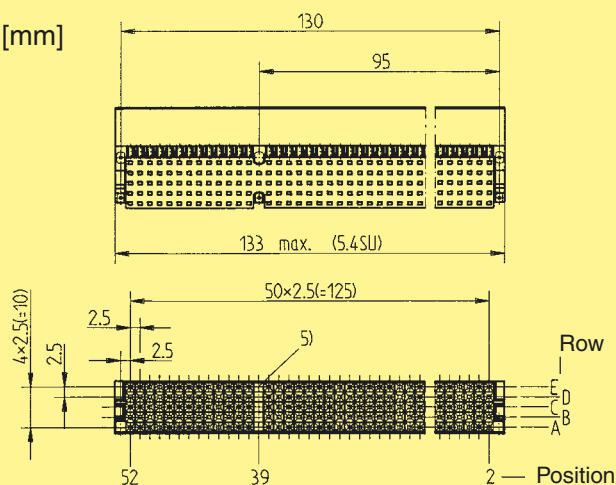
- 1) Non-metallised drillings
- 2) No tracks, except solder eyes
- 3) Limit area of components (valid for both pcb-sides)
- 4) For press-in connection DIN EN 60 352-5



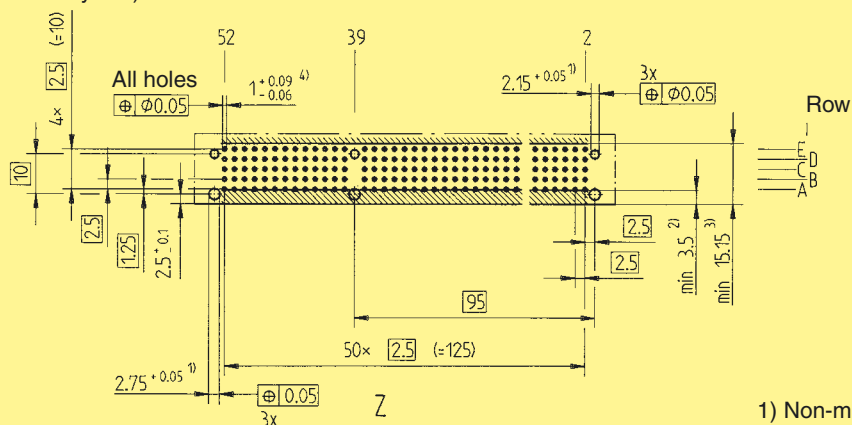
## Female connectors, angled

| Identification                                    | Number of contacts | Contact arrangement* | Part number                             |
|---------------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 5.4 SU female connector with press-in termination | 78                 | 3                    | 07 25 319 7015<br><b>07 25 319 8015</b> |
|                                                   | 126                | 2                    | 07 25 219 7015<br><b>07 25 219 8015</b> |
|                                                   | 200                | 8                    | 07 25 819 7015<br><b>07 25 819 8015</b> |
|                                                   | 250                | 1                    | 07 25 119 7015<br><b>07 25 119 8015</b> |

## Connector dimensions [mm]



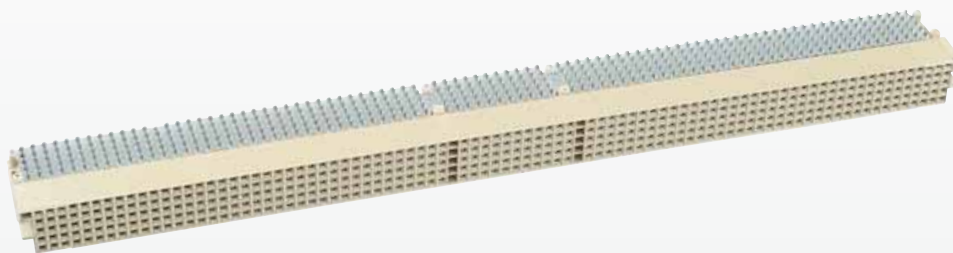
## Board drillings (revolved by 90°)



- 1) Non-metallised drillings
- 2) No tracks, except solder eyes
- 3) Limit area of components (valid for both pcb-sides)
- 4) For press-in connection DIN EN 60 352-5
- 5) Aperture for male contact

\* Contact arrangements see page 09.03

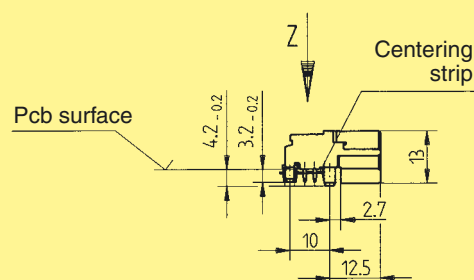
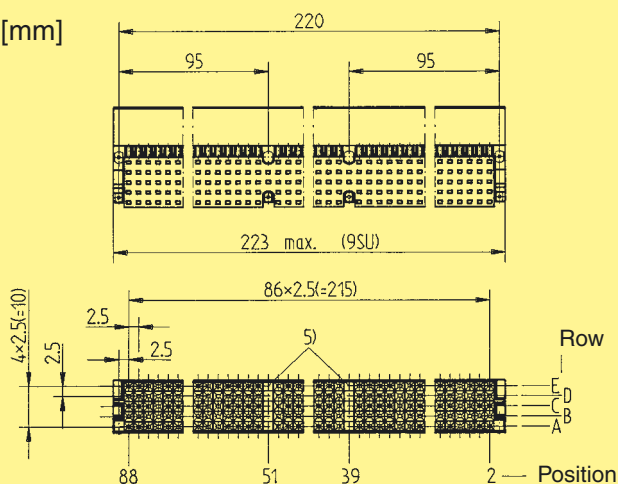
Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**



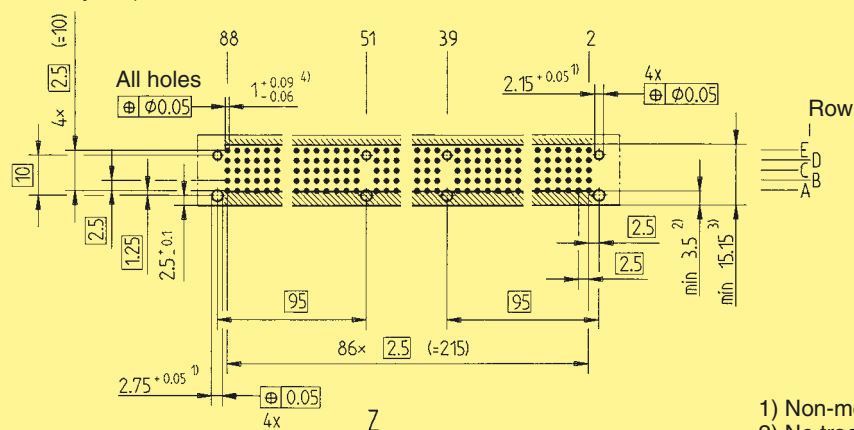
## Female connectors, angled

| Identification                                  | Number of contacts | Contact arrangement* | Part number                             |
|-------------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 9 SU female connector with press-in termination | 132                | 3                    | 07 29 319 7015<br><b>07 29 319 8015</b> |
|                                                 | 214                | 2                    | 07 29 219 7015<br><b>07 29 219 8015</b> |
|                                                 | 340                | 8                    | 07 29 819 7015<br><b>07 29 819 8015</b> |
|                                                 | 425                | 1                    | 07 29 119 7015<br><b>07 29 119 8015</b> |

### Connector dimensions [mm]



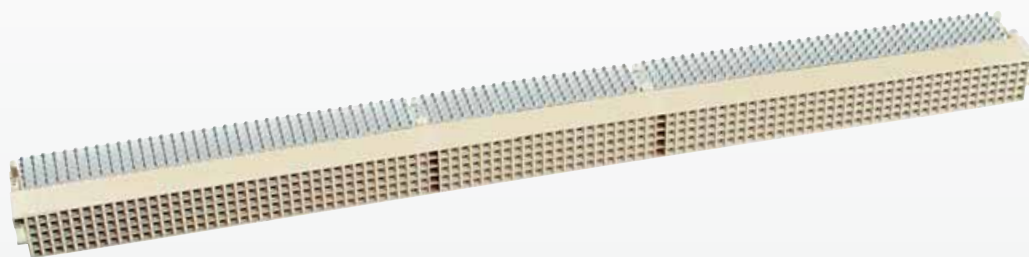
Board drillings  
(revolved by 90°)



- 1) Non-metallised drillings
- 2) No tracks, except solder eyes
- 3) Limit area of components (valid for both pcb-sides)
- 4) For press-in connection DIN EN 60 352-5
- 5) Apertures for male contacts

\* Contact arrangements see page 09.03

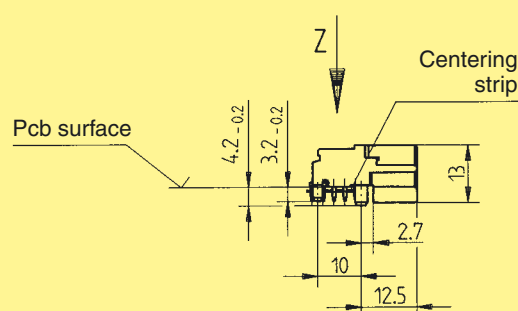
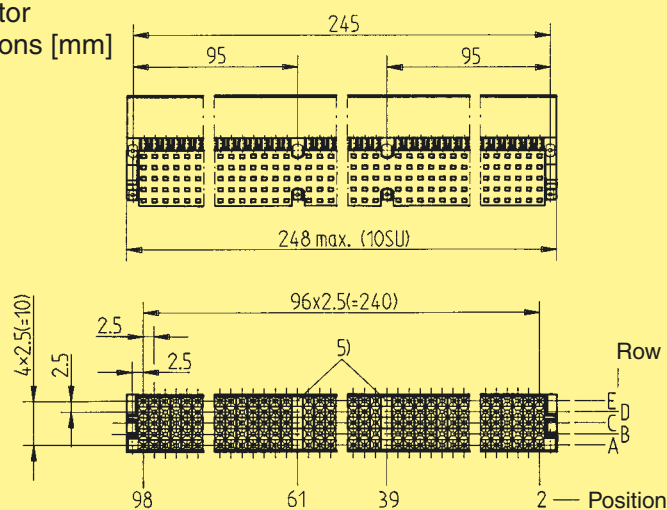
Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**



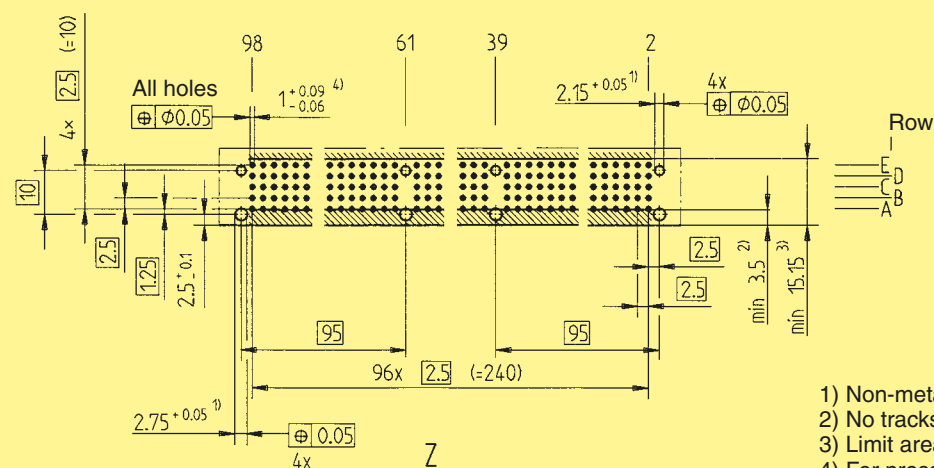
## Female connectors, angled

| Identification                                   | Number of contacts | Contact arrangement* | Part number                             |
|--------------------------------------------------|--------------------|----------------------|-----------------------------------------|
| 10 SU female connector with press-in termination | 147                | 3                    | 07 20 319 7015<br><b>07 20 319 8015</b> |
|                                                  | 239                | 2                    | 07 20 219 7015<br><b>07 20 219 8015</b> |
|                                                  | 380                | 8                    | 07 20 819 7015<br><b>07 20 819 8015</b> |
|                                                  | 475                | 1                    | 07 20 119 7015<br><b>07 20 119 8015</b> |

### Connector dimensions [mm]



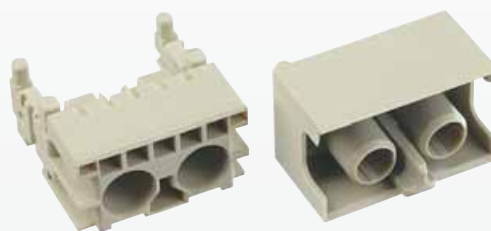
Board drillings  
(revolved by 90°)



- 1) Non-metallised drillings
- 2) No tracks, except solder eyes
- 3) Limit area of components (valid for both pcb-sides)
- 4) For press-in connection DIN EN 60 352-5
- 5) Apertures for male contacts

\* Contact arrangements see page 09.03

Thin print part numbers: performance level 1  
**Bold print part numbers: performance level 2**



## Male and female moulding

| Identification           | Number of contacts | Part number    | Drawing                                                                                                                                                                                                                                                                                                                                                                                    | Dimensions in mm |
|--------------------------|--------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Female moulding, angled* | 2                  | 07 31 010 0015 | <p>Technical drawing of the female moulding component (07 31 010 0015). It includes top, side, and cross-sectional views. Key dimensions include: top view width 23 max., hole spacing 4x2,5 (=10), hole diameter 2,5, and various mounting hole dimensions (2,15, 2,75, 2,5, 10, 12,5, 13, 23,7, 3,5, 3,75). Cross-section shows a 1,4-2,4 mm thick plate with 1,6 mm holes.</p>          |                  |
| Male moulding, straight* | 2                  | 07 11 010 0015 | <p>Technical drawing of the male moulding component (07 11 010 0015). It includes top, side, and cross-sectional views. Key dimensions include: top view width 24,8, height 13,65, hole spacing 4x2,5 (=10), hole diameter 2,5, and various mounting hole dimensions (2,15, 2,75, 2,5, 10, 12,5, 13, 23,7, 3,5, 3,75). Cross-section shows a 1,6-4,5 mm thick plate with 1,6 mm holes.</p> |                  |

\* cavities acc. DIN 41 626. Special contacts see page 09.28

### Identification

### Part No. Performance level 2

### Drawing

### Dimensions in mm

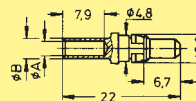
#### High current male contacts for female moulding angled<sup>1)</sup>

for straight crimp  
termination



10 A  
20 A  
40 A

09 03 000 6113  
09 03 000 6114  
09 03 000 6115



|      | ø A  | ø B  |
|------|------|------|
| 10 A | 1.85 | 2.55 |
| 20 A | 2.8  | 3.7  |
| 40 A | 4.4  | 5.6  |

for straight solder  
termination



10 A

09 03 000 6101



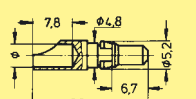
20 A

09 03 000 6102



40 A

09 03 000 6103



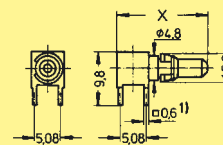
|      | ø   |
|------|-----|
| 10 A | 1.7 |
| 20 A | 2.8 |
| 40 A | 4.8 |

for angled pcb  
termination



40 A

09 03 000 6104



<sup>1)</sup> Solder pins for  
hole ø 1 ± 0.1 mm

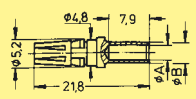
#### High current female contacts for male moulding straight<sup>1)</sup>

for straight crimp  
termination



10 A  
20 A  
40 A

09 03 000 6213  
09 03 000 6214  
09 03 000 6215



|      | ø A  | ø B  |
|------|------|------|
| 10 A | 1.85 | 2.55 |
| 20 A | 2.8  | 3.7  |
| 40 A | 4.4  | 5.6  |

for straight solder  
termination



10 A

09 03 000 6201



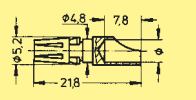
20 A

09 03 000 6202



40 A

09 03 000 6203



|      | ø   |
|------|-----|
| 10 A | 1.7 |
| 20 A | 2.8 |
| 40 A | 4.8 |

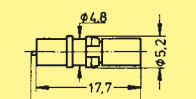
#### High voltage male contact for male moulding straight<sup>2)</sup>

for straight solder  
termination



2.8 kV

09 03 000 6140



Wire gauge  
max. 0.5 mm<sup>2</sup>

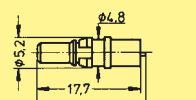
#### High voltage female contact for female moulding angled<sup>2)</sup>

for straight solder  
termination



2.8 kV

09 03 000 6240



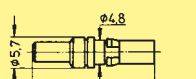
Wire gauge  
max. 0.5 mm<sup>2</sup>

#### Male coaxial contact 50 Ω for male moulding straight

for straight solder  
and/or crimp termination



09 03 000 6160

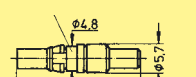


for cables  
RG 174 A/U  
RG 188 A/U  
RG 316 U

#### Female coaxial contacts 50 Ω for female moulding angled

for straight solder and/or crimp termination

09 03 000 6274

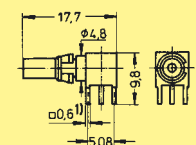


for cables  
RG 174 A/U  
RG 188 A/U  
RG 316 U

angled for pcb termination



09 03 000 6262



<sup>1)</sup> Solder pins for  
hole ø 1 ± 0.1 mm

#### Crimping tool

for high current contacts



09 99 000 0196

#### Crimping tool

for coaxial contacts



09 99 000 0194

<sup>1)</sup> Contact resistance max. 1.5 mΩ

<sup>2)</sup> Contact resistance internal wire max. 3 mΩ  
Other contacts on request



## Identification

Part number

Guide pin

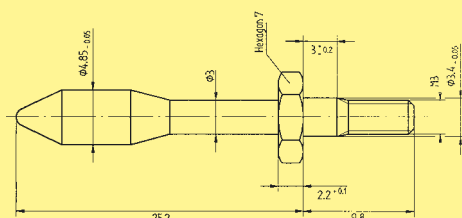
07 73 000 0291

Receptacle for guide pin

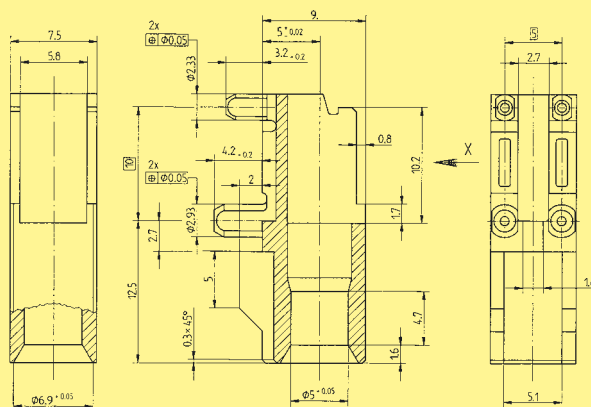
07 73 000 0280

## Dimensions [mm]

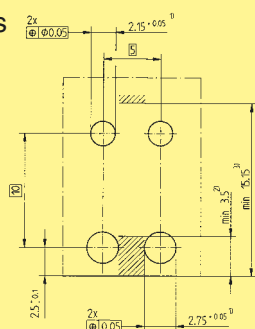
Guide pin\*



Receptacle  
for guide pin



Board drillings  
(View-X)



### General information

The guide pin solution from HARTING allows safe mating under sometimes extreme conditions. This might be large and heavy boards that bow under their own weight. Also insufficiently aligned or worn out rack systems can be tolerated better with the use of HARTING's guiding system, which also reduces the potential danger of damaging cards when being forced into flexing racks.

The guide pin and receptacle's design solution allows to overcome a 3 mm [.118"] offset between the backplane and the mating daughtercard. The reducing diameter of the pin (from 4.85 mm to 3 mm) ensures that it's positioning task is smoothly transferred to the connectors as soon as they start to engage. Finally the thin diameter section of the guide pin is no longer positioned by the ferrule of the receptacle, ensuring that the pin is able to freely follow any movement imposed by the engaging connector. This ensures that there is no static stress between the connectors and the guiding system.

The rugged metal designed guide pin is screwed to the backplane with standard hexagon screws. Whereas the molded receptacle is designed with four press fit pegs that can be installed to the board together with the connectors.

The tooling can be ordered with the part numbers **07 79 000 0157** (top tool) and **07 79 000 0158** (bottom tool).

- 1) Non-metallised drillings
- 2) No tracks, except solder eyes
- 3) Limit area of components (valid for both pcb sides)

\* Recommended board drilling is 3.5 (-0.05) mm





## Mini Coax modules (press-fit)

Page

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| Mini Coax connector system – general information .....   | <b>10.02</b> |
| Technical characteristics .....                          | <b>10.04</b> |
| Transmission characteristics .....                       | <b>10.05</b> |
| Mini Coax straight modules for backplane assembly .....  | <b>10.09</b> |
| Mini Coax angled modules for daughtercard assembly ..... | <b>10.10</b> |
| Mini Coax cable assemblies .....                         | <b>10.11</b> |
| Mini Coax power modules for daughtercard assembly .....  | <b>10.12</b> |

The Mini Coax connector system is a multi line RF interconnection for board-to-backplane applications. The Mini Coax allows transmission of radio frequency signals up to 2.5 GHz per line. Moreover this connector system is compact, ruggedised and provides total mating reliability due to its closed entry. The compact size (a 10 coaxial line connector is as small as a PC's enter key) and excellent crosstalk features propel this connector system for high end equipment within cellular telecom infrastructure.

The modules are available in metric sizes 1.00, 1.25 and 1.50 SU (SU = System Unit = 25 mm) for both cable harnesses and pcb's with 2 to 10 coaxial lines. The angled daughtercard modules and the straight backplane modules are press-fitted with simple tooling. The straight modules are delivered with an

inserted plastic cap that protects the coaxial contacts against dust and dirt as well as being used as an upper press-in tool. So an easy and safe flat rock process is guaranteed.

In addition to the coax modules an angled power connector with press-in termination is available. It is assembled in the same board drillings as the coaxial configuration and can be loaded up to 15 A working current at 70 °C.

Customer specific cable assemblies utilising different modules are manufactured on request. An extensive accessory and tooling range compliments the wide product range.

Both connector types (Mini Coax and *har-bus*<sup>®</sup> HM) are made for simultaneous use on the same board (see Fig. 2).

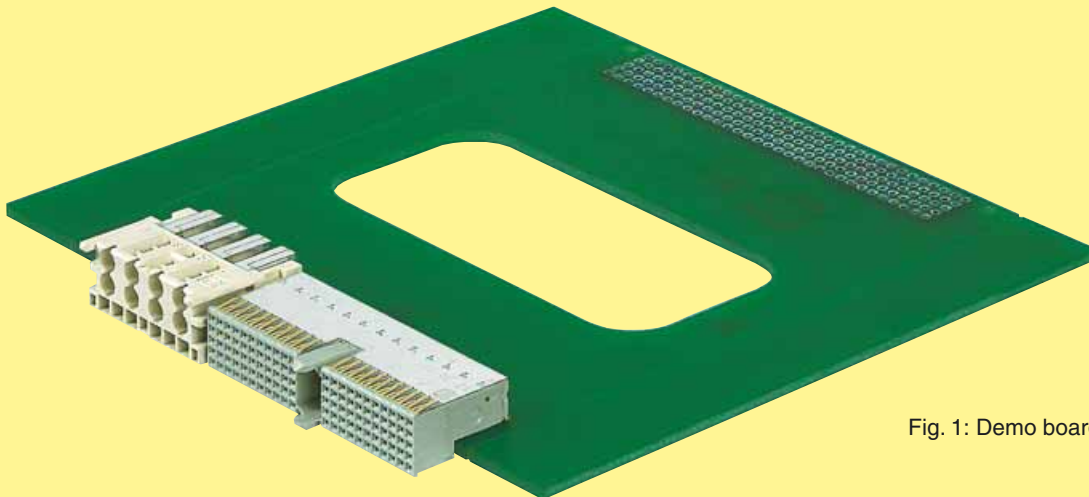


Fig. 1: Demo board

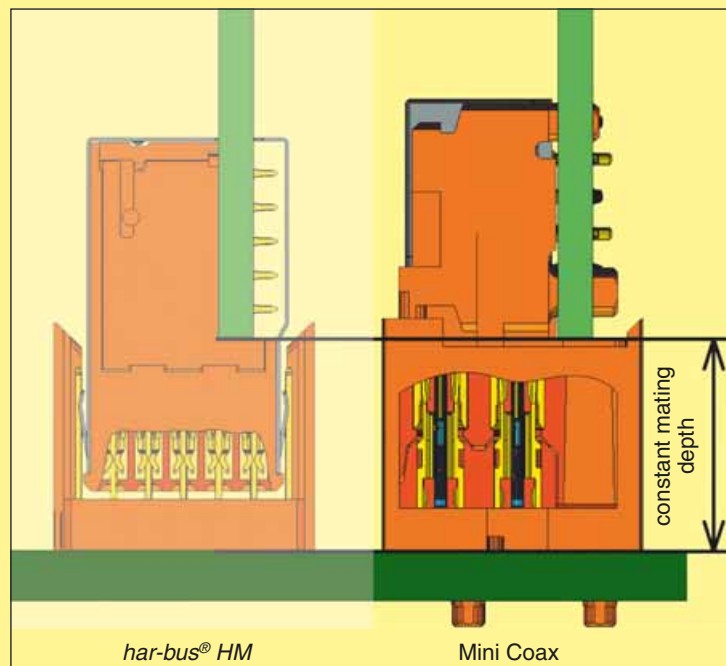


Fig. 2: Cross section of both connector types

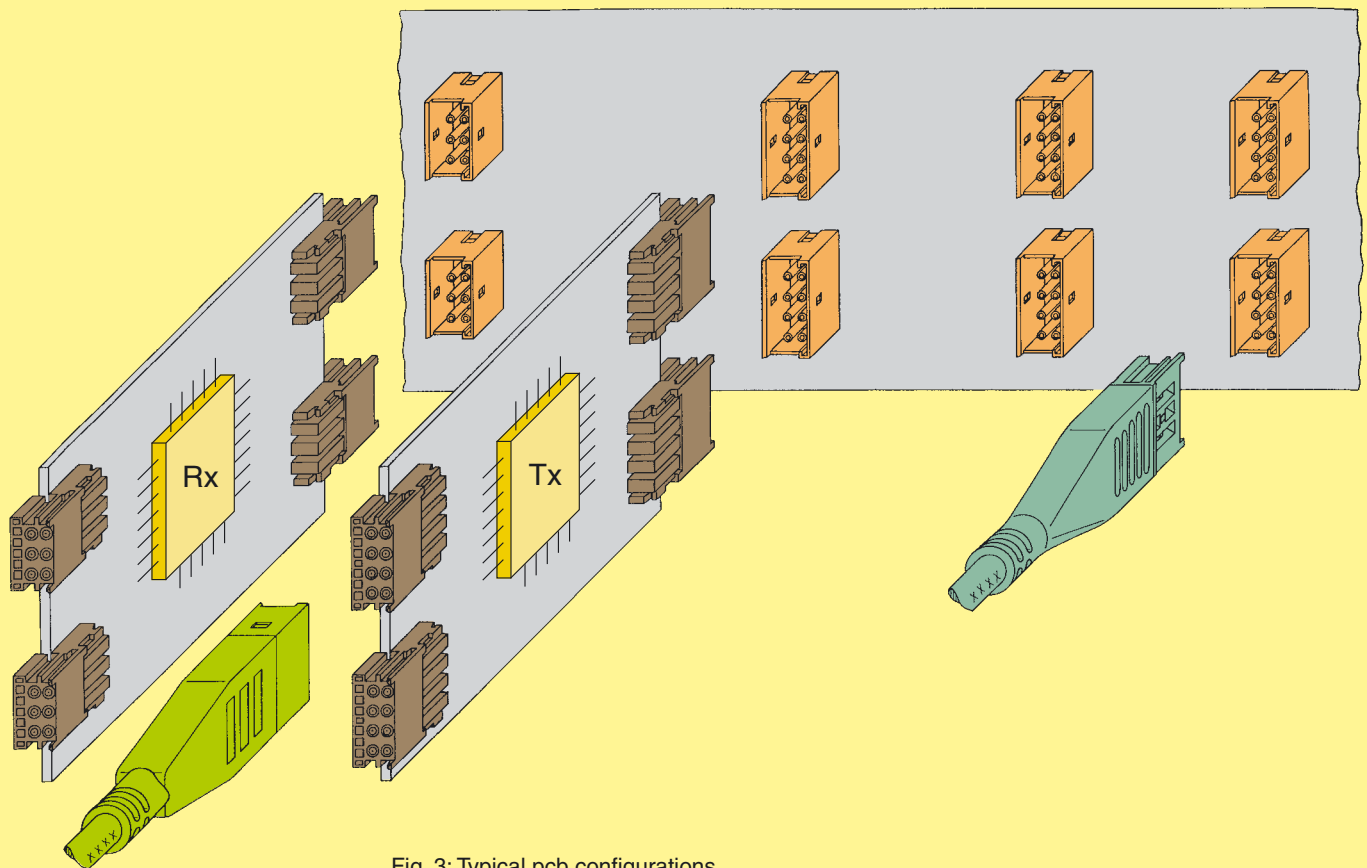


Fig. 3: Typical pcb configurations

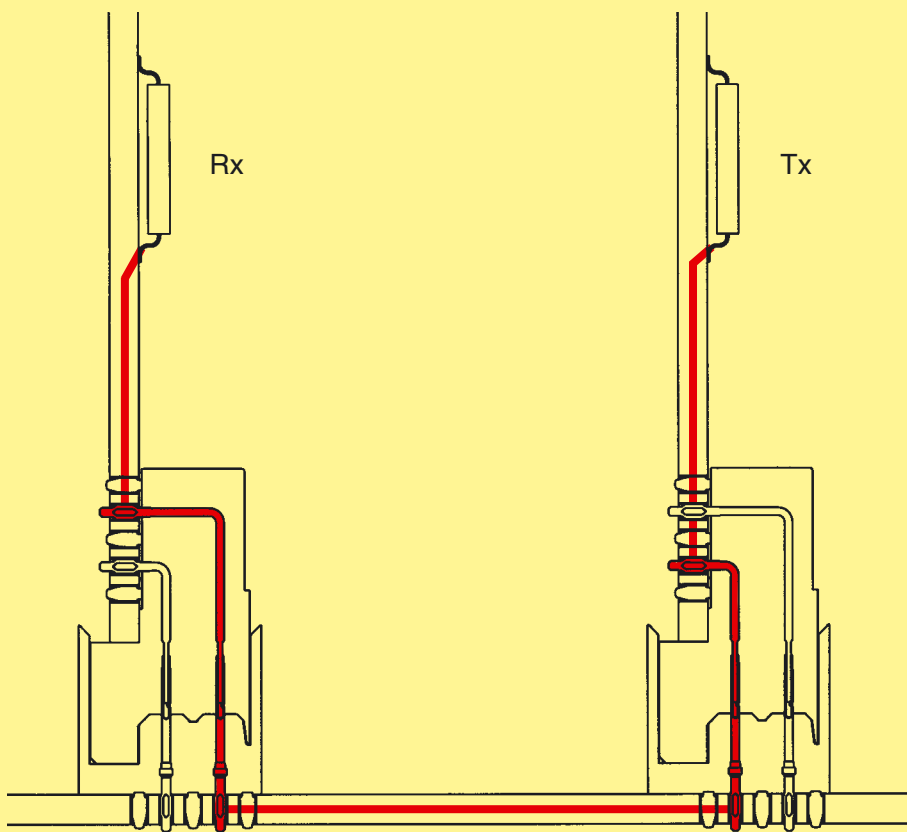


Fig. 4: Signal path of an analog RF signal from Rx to Tx

Rx: Receiver  
Tx: Transceiver

|                                                      |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|------------------------------------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------|---------------------|----|-----------------|----|-----------------|-------------|--------------|--------------------------------|------|---------------------|----|-----------------|----|------------------|-------------|--------------|---------------------------|------|---------------------|----|-----------------|----|-------------|----|-------------------|-------------|--------------|--------------------------|------|---------------------|----|-----------------|----|-----------------|-------------|--------------|------------------------------|------|---------------------|----|-----------------|-------------|--------------|
| Number of contacts                                   | :           | 2, 4, 6, 8 or 10 coaxial contacts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Dielectric withstanding Voltage $U_{r.m.s.}$         | :           | $\leq 1000$ V (for 60s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Power                                                | :           | $\leq 40$ W (at 2.5 GHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| DC-contact resistance                                | :           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Centre contact                                       | :           | $\leq 12$ m $\Omega$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Ground contact                                       | :           | $\leq 6$ m $\Omega$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Insulation resistance                                | :           | $\geq 5000$ M $\Omega$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Nominal impedance                                    | :           | 50 $\Omega$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Frequency range                                      | :           | 0 – 2.5 GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Return loss*<br>(see Fig. 11)                        | :           | $\geq 22$ dB <sup>1)</sup> (0 ... 2.5 GHz) equal to VSWR $\leq 1.17$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Insertion loss<br>(see Fig. 10)                      | :           | $\leq 0.25$ dB <sup>1)</sup> (0 ... 2.5 GHz)<br>$\leq 0.8$ dB <sup>2)</sup> (0 ... 2.5 GHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Crosstalk attenuation<br>(see Fig. 12)               | :           | 35 dB / 50 dB / 70 dB <sup>2)</sup> (0 ... 2.5 GHz)<br>depending on distances between adjacent contacts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Mating cycles                                        | :           | max. 500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Recommended configuration<br>of plated through holes | :           | <table> <tr> <td rowspan="4"><i>Tin-lead plated PCB (HAL) acc. DIN EN 60352-5</i></td><td>Hole</td><td>1.15<math>\pm</math>0.025 mm</td></tr> <tr> <td>Cu</td><td>min. 25 <math>\mu</math>m</td></tr> <tr> <td>Sn</td><td>max. 15 <math>\mu</math>m</td></tr> <tr> <td>Plated hole</td><td>0.94-1.09 mm</td></tr> <tr> <td rowspan="4"><i>Chemical tin-plated PCB</i></td><td>Hole</td><td>1.15<math>\pm</math>0.025 mm</td></tr> <tr> <td>Cu</td><td>min. 25 <math>\mu</math>m</td></tr> <tr> <td>Sn</td><td>min. 0.8 <math>\mu</math>m</td></tr> <tr> <td>Plated hole</td><td>1.00-1.10 mm</td></tr> <tr> <td rowspan="5"><i>Au / Ni plated PCB</i></td><td>Hole</td><td>1.15<math>\pm</math>0.025 mm</td></tr> <tr> <td>Cu</td><td>min. 25 <math>\mu</math>m</td></tr> <tr> <td>Ni</td><td>3-7 <math>\mu</math>m</td></tr> <tr> <td>Au</td><td>0.05-0.12 <math>\mu</math>m</td></tr> <tr> <td>Plated hole</td><td>1.00-1.10 mm</td></tr> <tr> <td rowspan="4"><i>Silver plated PCB</i></td><td>Hole</td><td>1.15<math>\pm</math>0.025 mm</td></tr> <tr> <td>Cu</td><td>min. 25 <math>\mu</math>m</td></tr> <tr> <td>Ag</td><td>0.1-0.3 <math>\mu</math>m</td></tr> <tr> <td>Plated hole</td><td>1.00-1.10 mm</td></tr> <tr> <td rowspan="3"><i>OSP copper plated PCB</i></td><td>Hole</td><td>1.15<math>\pm</math>0.025 mm</td></tr> <tr> <td>Cu</td><td>min. 25 <math>\mu</math>m</td></tr> <tr> <td>Plated hole</td><td>1.00-1.10 mm</td></tr> </table> | <i>Tin-lead plated PCB (HAL) acc. DIN EN 60352-5</i> | Hole | 1.15 $\pm$ 0.025 mm | Cu | min. 25 $\mu$ m | Sn | max. 15 $\mu$ m | Plated hole | 0.94-1.09 mm | <i>Chemical tin-plated PCB</i> | Hole | 1.15 $\pm$ 0.025 mm | Cu | min. 25 $\mu$ m | Sn | min. 0.8 $\mu$ m | Plated hole | 1.00-1.10 mm | <i>Au / Ni plated PCB</i> | Hole | 1.15 $\pm$ 0.025 mm | Cu | min. 25 $\mu$ m | Ni | 3-7 $\mu$ m | Au | 0.05-0.12 $\mu$ m | Plated hole | 1.00-1.10 mm | <i>Silver plated PCB</i> | Hole | 1.15 $\pm$ 0.025 mm | Cu | min. 25 $\mu$ m | Ag | 0.1-0.3 $\mu$ m | Plated hole | 1.00-1.10 mm | <i>OSP copper plated PCB</i> | Hole | 1.15 $\pm$ 0.025 mm | Cu | min. 25 $\mu$ m | Plated hole | 1.00-1.10 mm |
| <i>Tin-lead plated PCB (HAL) acc. DIN EN 60352-5</i> | Hole        | 1.15 $\pm$ 0.025 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Cu          | min. 25 $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Sn          | max. 15 $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Plated hole | 0.94-1.09 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| <i>Chemical tin-plated PCB</i>                       | Hole        | 1.15 $\pm$ 0.025 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Cu          | min. 25 $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Sn          | min. 0.8 $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Plated hole | 1.00-1.10 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| <i>Au / Ni plated PCB</i>                            | Hole        | 1.15 $\pm$ 0.025 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Cu          | min. 25 $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Ni          | 3-7 $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Au          | 0.05-0.12 $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Plated hole | 1.00-1.10 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| <i>Silver plated PCB</i>                             | Hole        | 1.15 $\pm$ 0.025 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Cu          | min. 25 $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Ag          | 0.1-0.3 $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Plated hole | 1.00-1.10 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| <i>OSP copper plated PCB</i>                         | Hole        | 1.15 $\pm$ 0.025 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Cu          | min. 25 $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
|                                                      | Plated hole | 1.00-1.10 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| PCB board thickness: $\geq 1,6$ mm                   |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Mating force                                         | :           | $\leq 5$ N/line                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Withdrawal force                                     | :           | $> 1$ N/line                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Grid pattern                                         | :           | 4.40 x 6.25 mm (within a twin x between twins)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Stack height                                         | :           | 9.5 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Mating distance                                      | :           | 12.5 ... 15 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Wiping length                                        | :           | 2.5 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Acceptable radial mating offset                      | :           | max. $\pm 1.5$ mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Temperature range                                    | :           | - 55 °C ... + 125 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Moulding material                                    | :           | Liquid Cristal Polymer (LCP), UL 94-V0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Contact surface                                      | :           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Contact zone                                         | :           | Au                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Termination area                                     | :           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Centre pin                                           | :           | Au                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |
| Ground pin                                           | :           | Ni                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                      |      |                     |    |                 |    |                 |             |              |                                |      |                     |    |                 |    |                  |             |              |                           |      |                     |    |                 |    |             |    |                   |             |              |                          |      |                     |    |                 |    |                 |             |              |                              |      |                     |    |                 |             |              |

\* Reference: short contact

<sup>1)</sup> Data of a separate Mini Coax mated connector pair including the press-in terminations to pcb

<sup>2)</sup> Data of Mini Coax connector pair including the whole test board environment (see Fig. 6)

### Mini Coax connector integrated in test boards

Transmission characteristics of a connector can only be measured within its typical environment. The environment for a board-to-board connector is generally a pcb (printed circuit board). The approach to determine the transmission characteristics of the connector itself is to measure the complete arrangement with special calibration techniques and to remove the parameters of the connector. The performance of the test board is responsible for the accuracy of the parameters on the connector itself.

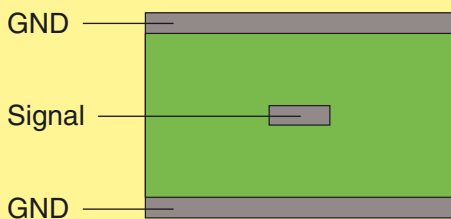


Fig. 5: Cross-section of a trace of the test board

The signal integrity of a test board is mainly influenced by the characteristic impedance, losses of pcb traces and the design of micro vias. It's obvious that the pin in hole of the connector and the vias have to be considered as one. This means that the thickness, material and the amount of layers of the pcb have to be taken into consideration for the characterisation of a board-to-board connector.

Fig. 6 shows the test boards with the integrated Mini Coax connector. The test boards are executed in stripline technology with a characteristic impedance of  $50\ \Omega$ . To connect the test boards with the cables of the measurement instrument, SMA connectors are used.

For high speed digital applications the main parameters are defined in the time-domain, like reflection loss, rise-time degradation, eye-opening etc. For RF-applications like in radio base stations or broadcasting services the frequency-domain is the preferred point-of view in order to characterise the systems and the components in regards to return loss, insertion loss, crosstalk, linearity etc.

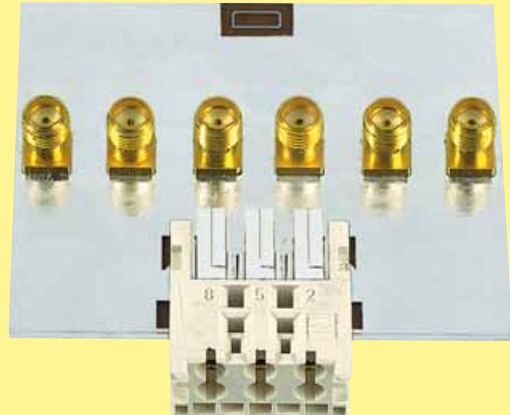


Fig. 6: Test boards with implemented Mini Coax connector

Figure 7 shows the signal path given by the Mini Coax connector and the components on the evaluation board. Significant areas in the signal path are indicated with the characters A...G and T for traces on the board.

The signal path was measured with a Time Domain Reflectometer (TDR) to determine the discontinuities of the arrangement (Fig. 8).

Figure 9 shows the equivalent circuit of the signal path with grouped elements for the Mini Coax connector. The parameters had been extracted from the measured TDR profile.

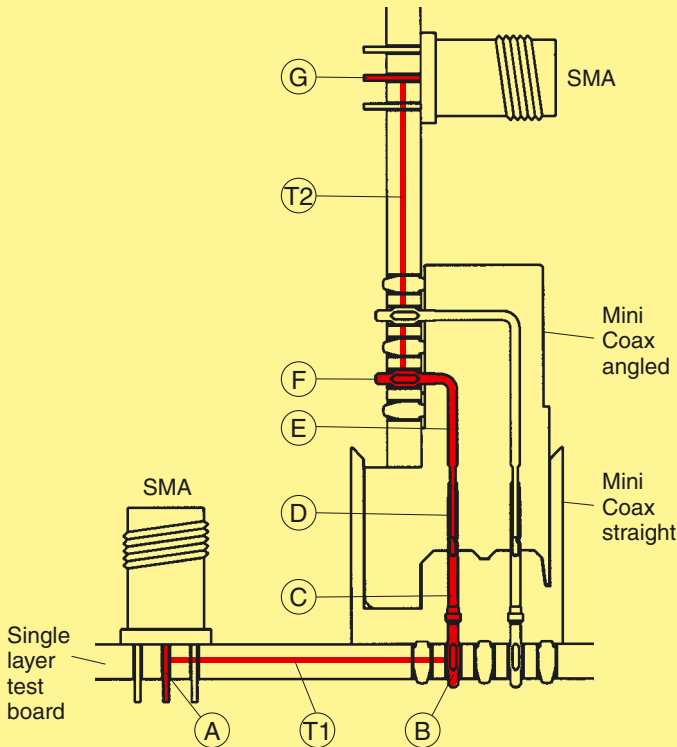


Fig. 7: Signal path of a board to board Mini Coax connector (SMA connectors used for measurement device connection)

Legend for Fig. 7 and Fig. 8

- (A) : SMA connector
- (T1) : 50  $\Omega$  trace of the backplane
- (B) : Pin in hole of the straight Mini Coax module
- (C) : Section of straight contact behaves capacitive
- (D) : Transition of the straight module to the angled module behaves inductive
- (E) : Section of angled contact behaves capacitive
- (F) : Pin in hole of the angled Mini Coax module
- (T2) : 50  $\Omega$  trace of the daughtercard
- (G) : SMA connector

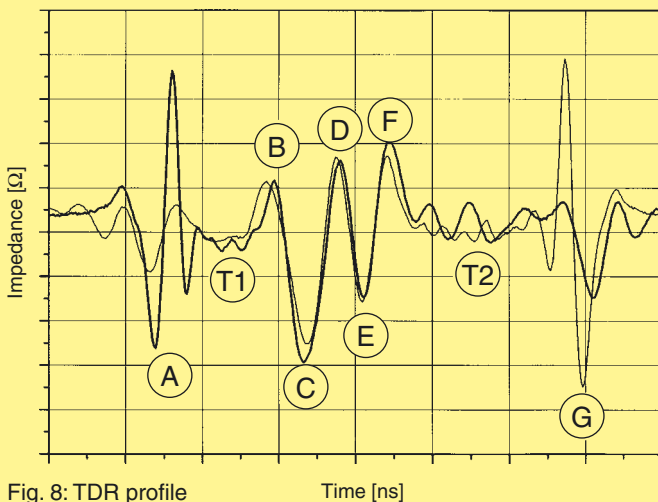


Fig. 8: TDR profile

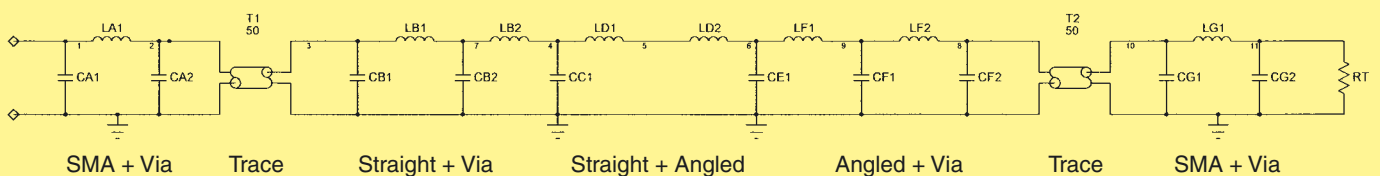


Fig. 9: Equivalent circuit with grouped elements



### Insertion and return loss

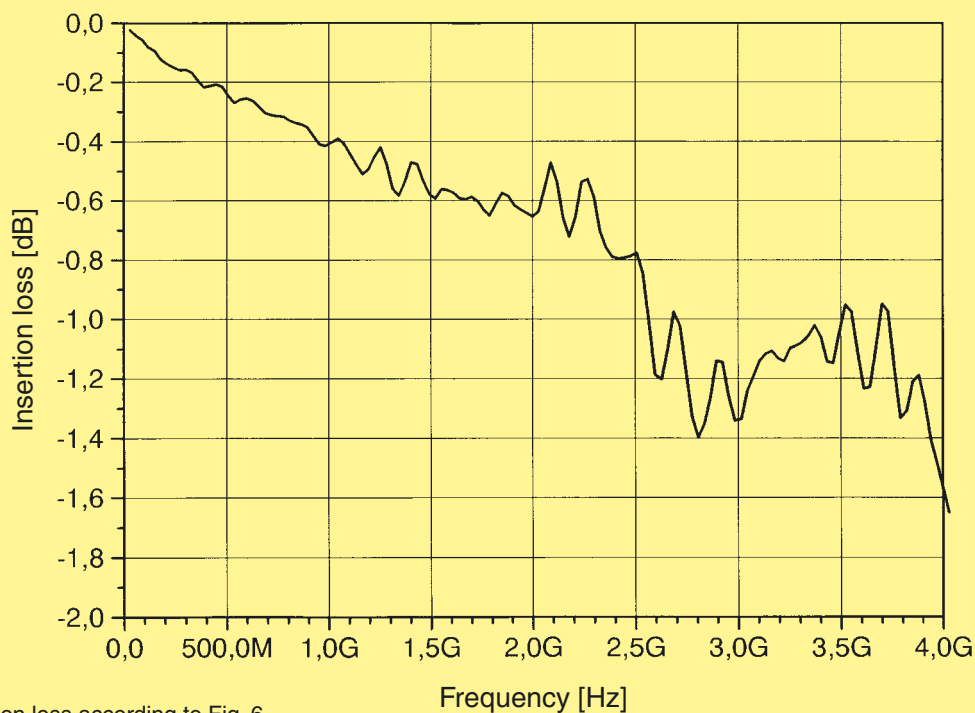


Fig. 10: Insertion loss according to Fig. 6

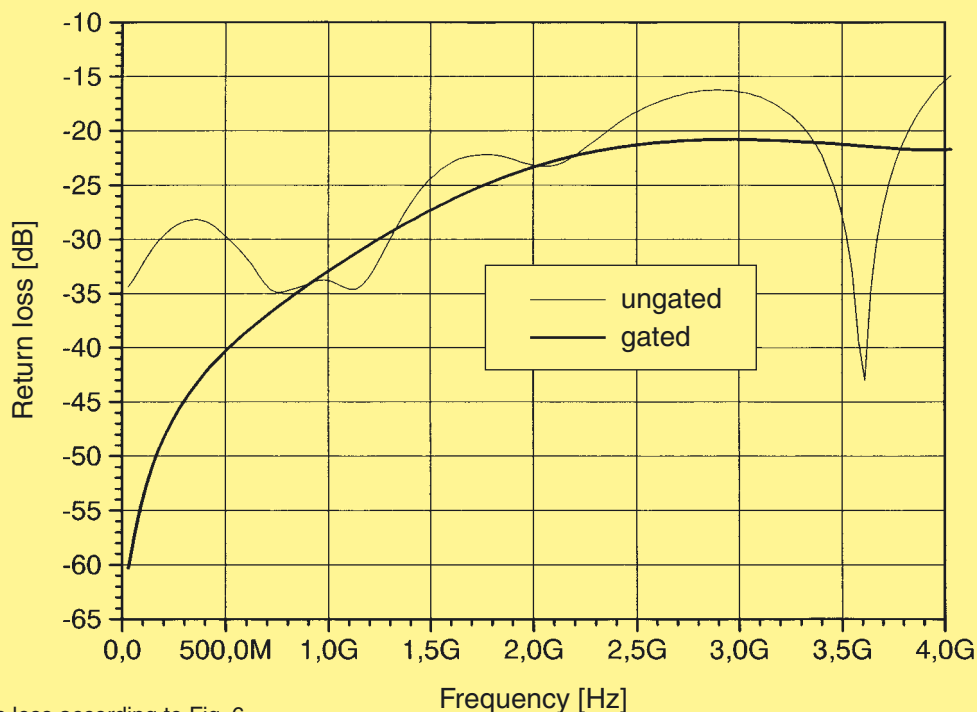


Fig. 11: Return loss according to Fig. 6

To extract the parameters of the connector itself the method of gating was selected. This eliminates the effects of SMA launchers. The test launchers reduce the performance of transmission characteristics due to their discontinuities.

## Near-end crosstalk of the Mini Coax modules

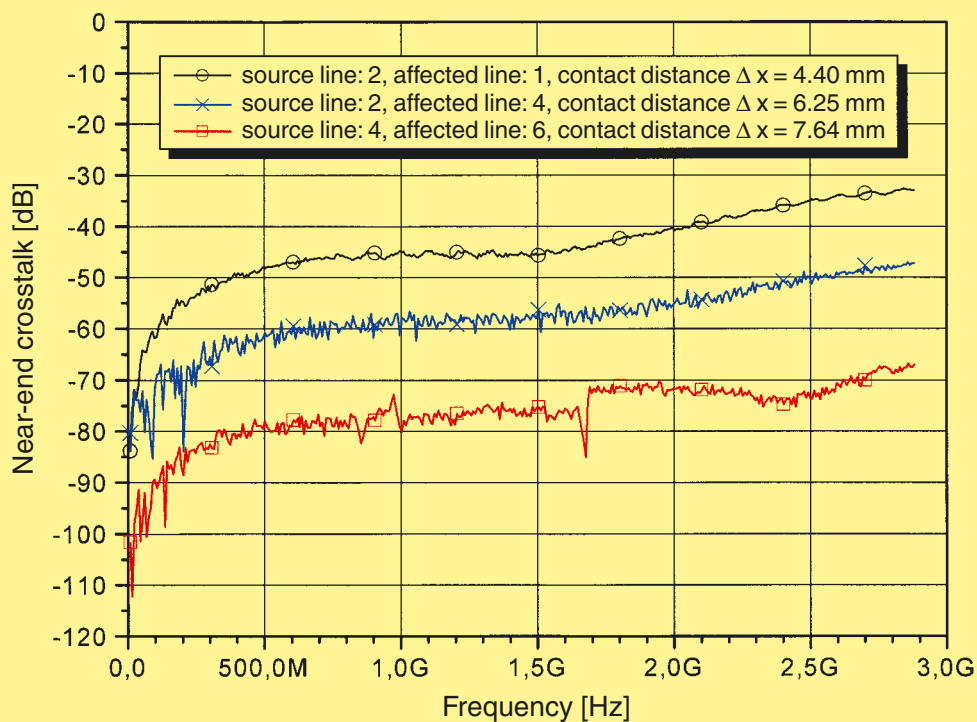


Fig. 12: Near-end crosstalk of several contact configurations

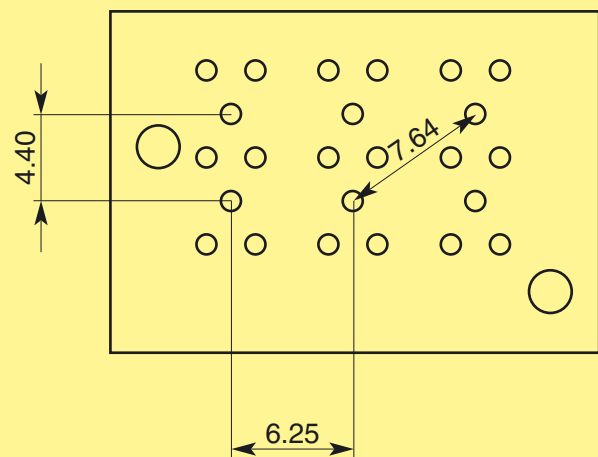
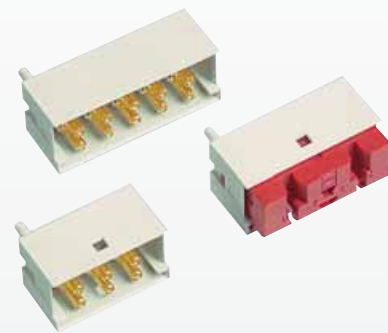


Fig. 13: Measured configurations [mm]

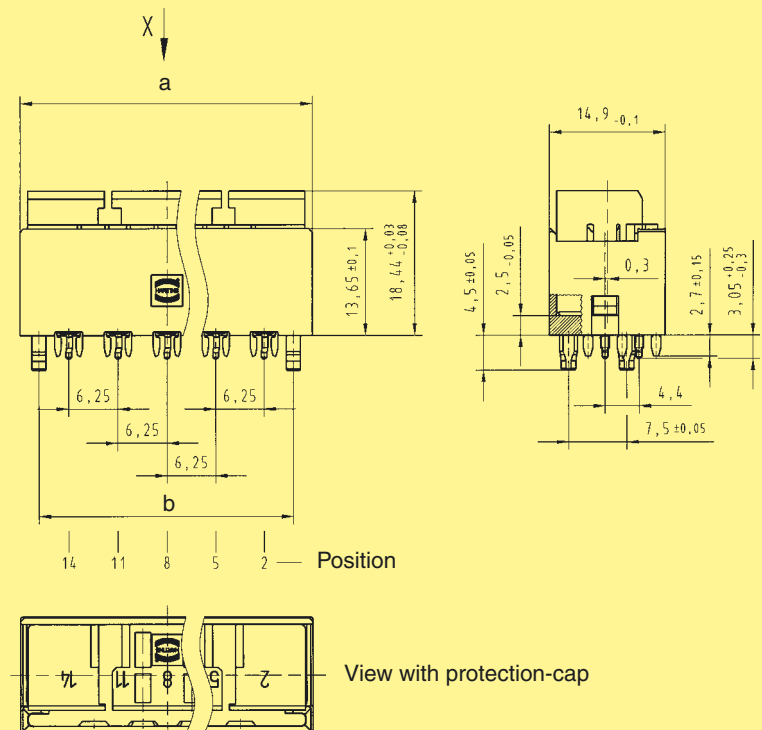
Even for the shortest distance of 4.40 mm crosstalk-values better than 30 dB can be achieved for frequencies of 2.5 GHz and above.



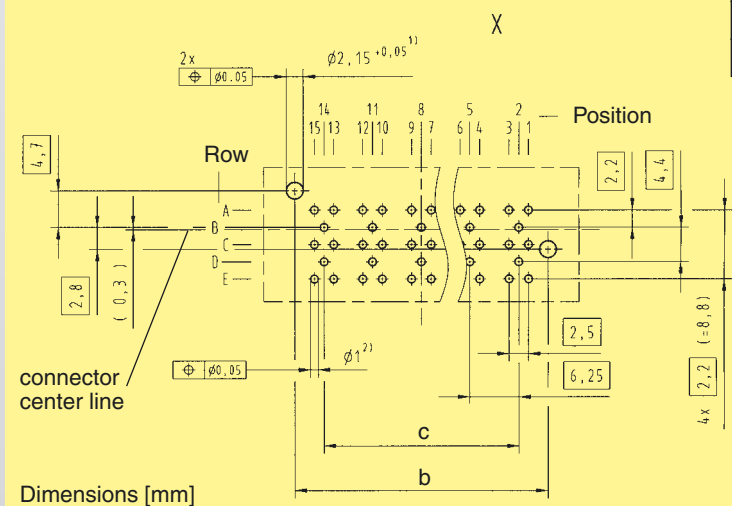
## Straight modules

| Identification                          | Number of contacts | SU   | loaded positions | Part number    |
|-----------------------------------------|--------------------|------|------------------|----------------|
| Mini Coax modules, press-in termination | 10                 | 1.50 | 2, 5, 8, 11, 14  | 07 11 100 0026 |
|                                         | 8                  | 1.25 | 2, 5, 8, 11      | 07 11 100 0024 |
|                                         | 6                  | 1    | 2, 5, 8          | 07 11 100 0023 |
|                                         | 4                  | 1    | 2, 8             | 07 11 900 0024 |
|                                         | 2                  | 1    | 2                | 07 11 900 0023 |

## Dimensions



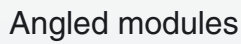
## Board drillings



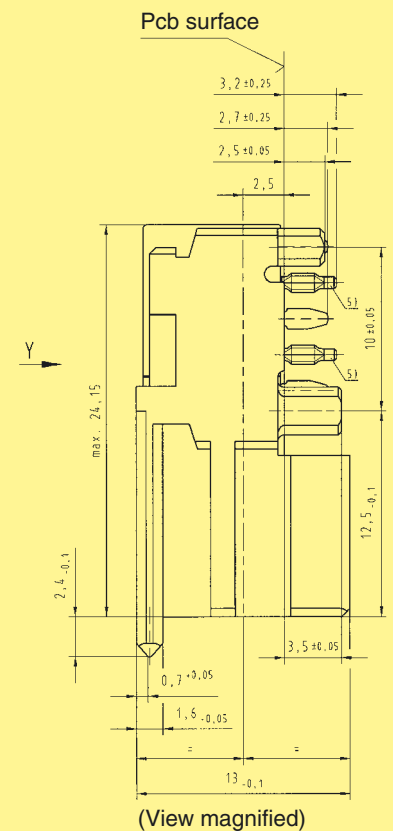
| Straight module | Dimension [mm] |       |       |
|-----------------|----------------|-------|-------|
|                 | a              | b     | c     |
| 1.50 SU         | 37.3           | 32.5  | 25    |
| 1.25 SU         | 31.05          | 26.25 | 18.75 |
| 1.00 SU         | 24.8           | 20    | 12.5  |

Row B, D: position 2, 5, 8, 11, 14 for signal line  
Row A, C, E: position 1, 3, 4, 6, 7, 9, 10, 12, 13, 15 for ground-line

1) Non-metallised drillings  
2) Details see page 10.04

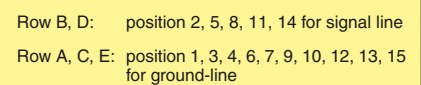


## Dimensions



(View magnified)

## Board drillings

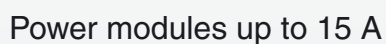


- 1) Non-metallised drillings
- 2) No tracks, except solder eyes
- 3) Limit area of components  
(valid for both pcb-sides)
- 4) Details see page 10.04
- 5) Press-in zone in any angular position  
related to it's longitudinal axis possible

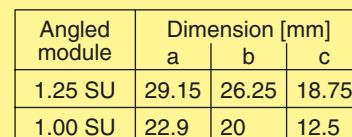
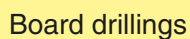
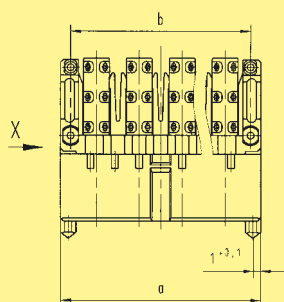


## Cable assemblies

| Identification                                      | Number of contacts | Part No.   | Drawing                                             | Dimensions [mm] |
|-----------------------------------------------------|--------------------|------------|-----------------------------------------------------|-----------------|
| Cable assembly for mating with the straight module* | 1-10               | on request | <br><br>• Position loaded with plug crimp contact * |                 |
| Cable assembly for mating with the angled module*   | 1-10               | on request | <br><br>• Position loaded with jack crimp contact * |                 |
| * Plug and jack crimp contacts                      |                    |            |                                                     |                 |



## Dimensions



- 1) Non-metallised drillings
- 2) No tracks, except solder eyes
- 3) Limit area of components  
(valid for both pcb-sides)

## Mini Coax+ modules (surface mount, SMT/SMC)

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| Mini Coax+ connector system – general information .....   | <b>11.02</b> |
| Technical characteristics .....                           | <b>11.03</b> |
| Transmission characteristics .....                        | <b>11.04</b> |
| Mini Coax+ straight modules for backplane assembly .....  | <b>11.05</b> |
| Mini Coax+ angled modules for daughtercard assembly ..... | <b>11.06</b> |



The Mini Coax standard connector system is now further enhanced with the **Mini Coax+**. This new connector system has been originally developed for 3rd generation telecom base stations. Excellent transmission characteristics are realised by the lowest connector losses and matched impedances of all internal sections. The Mini Coax+ connector therefore offers best transmission characteristics for RF signals up to 4 GHz.

The modules are available in metric size 1.00 SU (SU = System Unit = 25 mm) with 2 to 6 coaxial lines. Mini Coax+ combines the advantages of both reflow

soldering principles SMC and SMT. SMC stands for 'Pin in Hole' and therefore provides high mechanical strength and endurance against dynamic and static shearing forces. SMT stands for 'Pin on Pad' and therefore provides highest RF performance of board terminations (see Fig. 1). Both principles allow fully automated assembly which promotes HARTING's multi coax connector to a product which offers an all in one solution:

- Fully automated board assembly
- Robust design
- Excellent RF performance

signal termination SMT

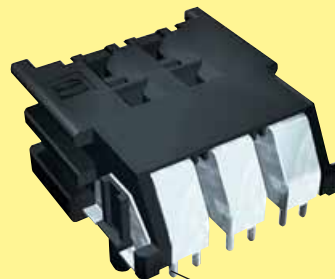
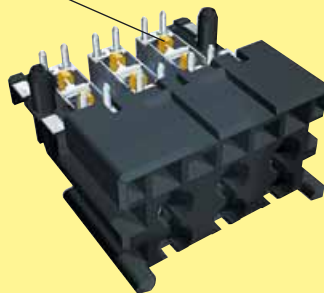


Fig. 1: Angled Mini Coax+ module

ground termination SMC

Based on available SPICE models for the connector customers' design-in can be supported by HARTING's in house RF competence centre with close co-operation. This guarantees optimised signal transmission in the target application. On this behalf our vision is to support the customer from the design-in phase to a real running application.

Mini Coax+ connectors are full mating compatible to standard Mini Coax connectors and offer a constant mating depth compared to product line *har-bus® HM+*. Therefore a simultaneous use on one board is possible in any mixed configuration (see Fig. 2).

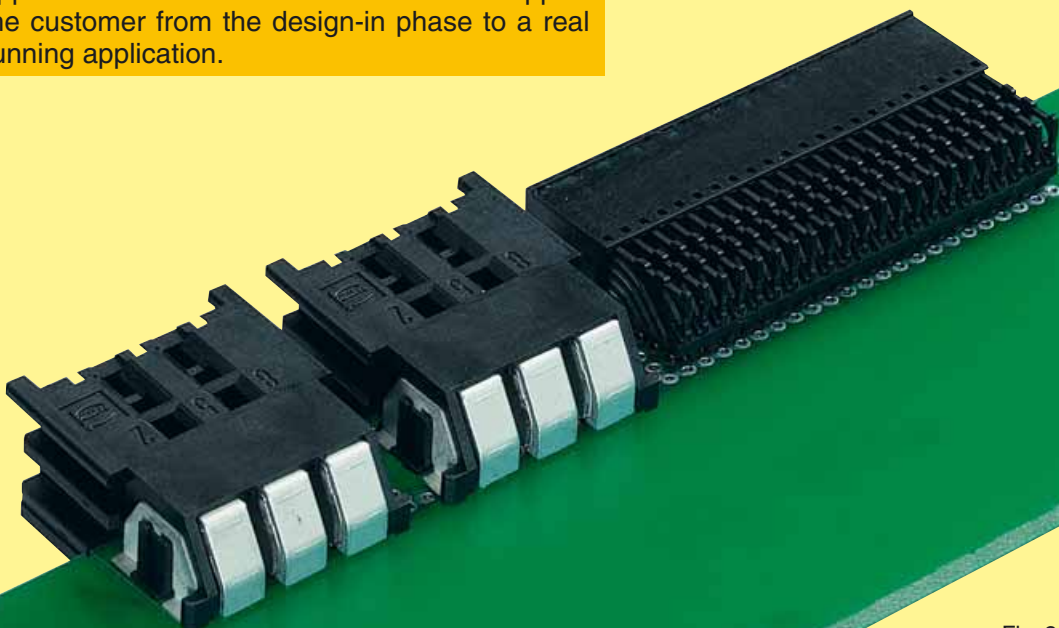


Fig. 2: Board with mixed connector configuration

|                                              |   |                                                                                                                                                                                                                                              |
|----------------------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of contacts                           | : | 2, 4 or 6 coaxial contacts                                                                                                                                                                                                                   |
| Dielectric withstanding Voltage $U_{r.m.s.}$ | : | $\leq 450$ V (for 60s)                                                                                                                                                                                                                       |
| DC-contact resistance                        |   |                                                                                                                                                                                                                                              |
| Centre contact                               | : | $\leq 15$ m $\Omega$                                                                                                                                                                                                                         |
| Ground contact                               | : | $\leq 6$ m $\Omega$                                                                                                                                                                                                                          |
| Insulation resistance                        | : | $\geq 5000$ M $\Omega$                                                                                                                                                                                                                       |
| Nominal impedance                            | : | 50 $\Omega$                                                                                                                                                                                                                                  |
| Frequency range                              | : | 0 – 4 GHz                                                                                                                                                                                                                                    |
| Return loss*<br>(see Fig. 4)                 | : | $\geq 20$ dB <sup>1)</sup> (0 ... 2.5 GHz) equal to VSWR $\leq 1.22$<br>$\geq 20$ dB <sup>1)</sup> (0 ... 4.0 GHz) equal to VSWR $\leq 1.22$                                                                                                 |
| Insertion loss<br>(see Fig. 3)               | : | $\leq 0.23$ dB <sup>1)</sup> (0 ... 2.5 GHz)<br>$\leq 0.75$ dB <sup>1)</sup> (0 ... 4.0 GHz)                                                                                                                                                 |
| Crosstalk attenuation                        | : | $\geq 50$ dB <sup>2)</sup> within a twin (0 ... 2.5 GHz)<br>$\geq 60$ dB <sup>2)</sup> between twins (0 ... 2.5 GHz)<br>$\geq 35$ dB <sup>2)</sup> within a twin (0 ... 4.0 GHz)<br>$\geq 45$ dB <sup>2)</sup> between twins (0 ... 4.0 GHz) |
| Mating cycles                                | : | max. 500                                                                                                                                                                                                                                     |
| Termination technique                        | : | <b>Surface Mount Technology (SMT / SMC)</b>                                                                                                                                                                                                  |
| Mating compatible                            | : | Mini Coax modules                                                                                                                                                                                                                            |
| Mating force                                 | : | $\leq 5$ N/line                                                                                                                                                                                                                              |
| Withdrawal force                             | : | $> 1$ N/line                                                                                                                                                                                                                                 |
| Grid pattern                                 | : | 4.40 x 6.25 mm (within a twin x between twins)                                                                                                                                                                                               |
| Mating distance                              | : | 12.5 ... 15 mm                                                                                                                                                                                                                               |
| Wiping length                                | : | 2.5 mm                                                                                                                                                                                                                                       |
| Acceptable radial mating offset:             |   | max. $\pm 1.5$ mm                                                                                                                                                                                                                            |
| Temperature range                            | : | $-55$ °C ... $+125$ °C                                                                                                                                                                                                                       |
| Reflow temperature                           | : | 220 °C for 2 minutes, 260 °C max.                                                                                                                                                                                                            |
| Moulding material                            | : | Liquid Cristal Polymer (LCP), UL 94-V0                                                                                                                                                                                                       |
| Contact surface                              |   |                                                                                                                                                                                                                                              |
| Contact zone                                 | : | Au                                                                                                                                                                                                                                           |

Note: Measurements with development samples of the straight Mini Coax+

\* Reference: short contact

<sup>1)</sup> Data of a separate Mini Coax+ mated connector pair including the microvias of pcb

<sup>2)</sup> Data of Mini Coax+ connector pair including the whole test board environment

## Insertion and return loss

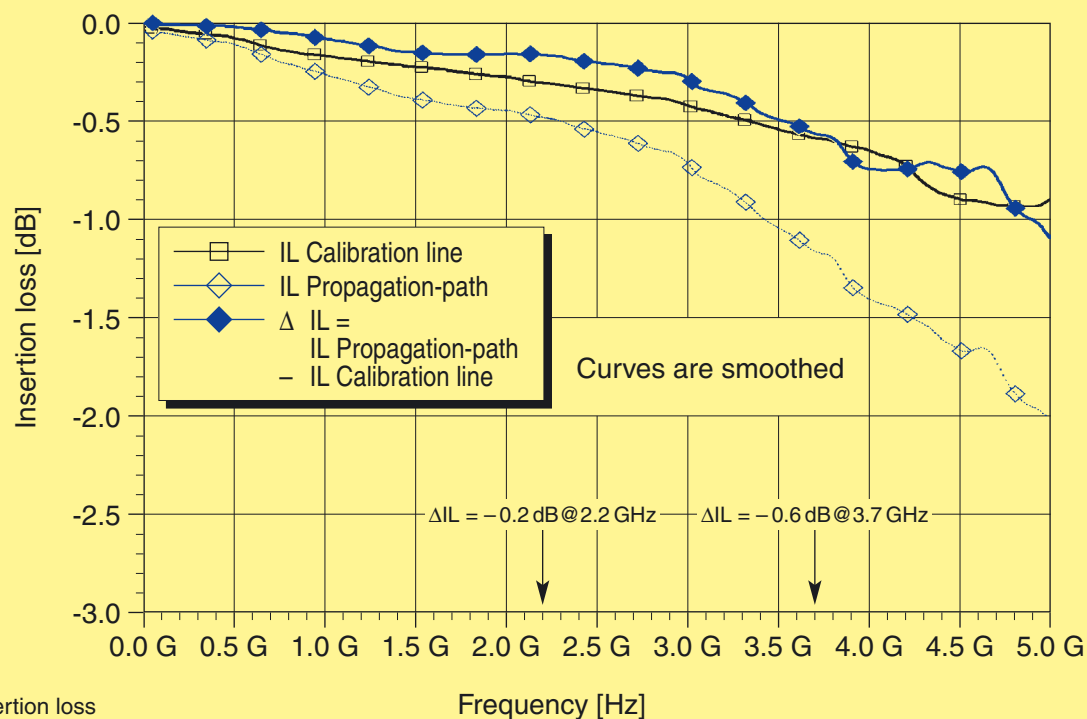


Fig. 3: Insertion loss  
of full measurement environment

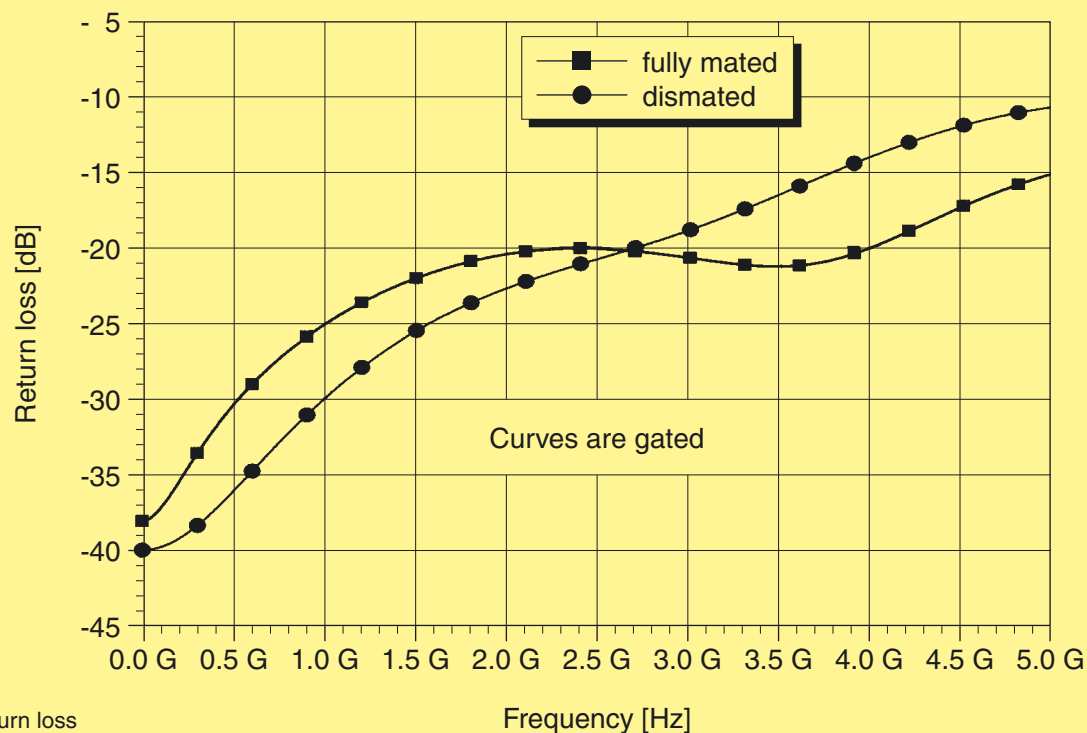


Fig. 4: Return loss

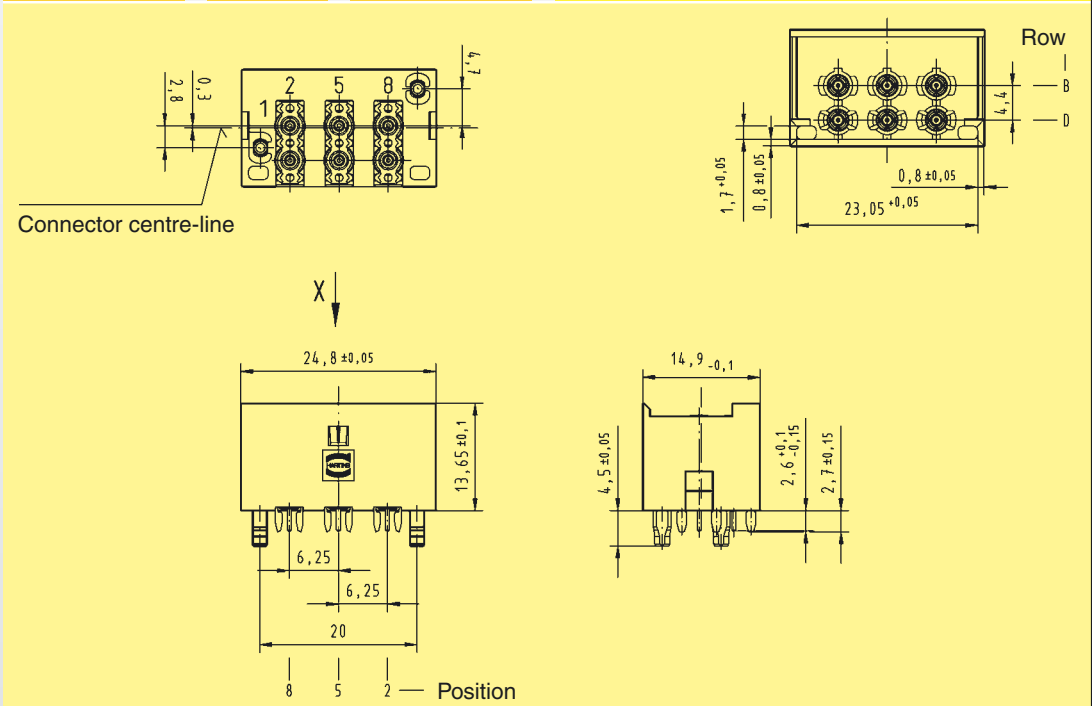
To extract the parameters of the connector itself the method of gating was selected. This eliminates the effects of SMA launchers. The test launchers reduce the performance of transmission characteristics due to their discontinuities.



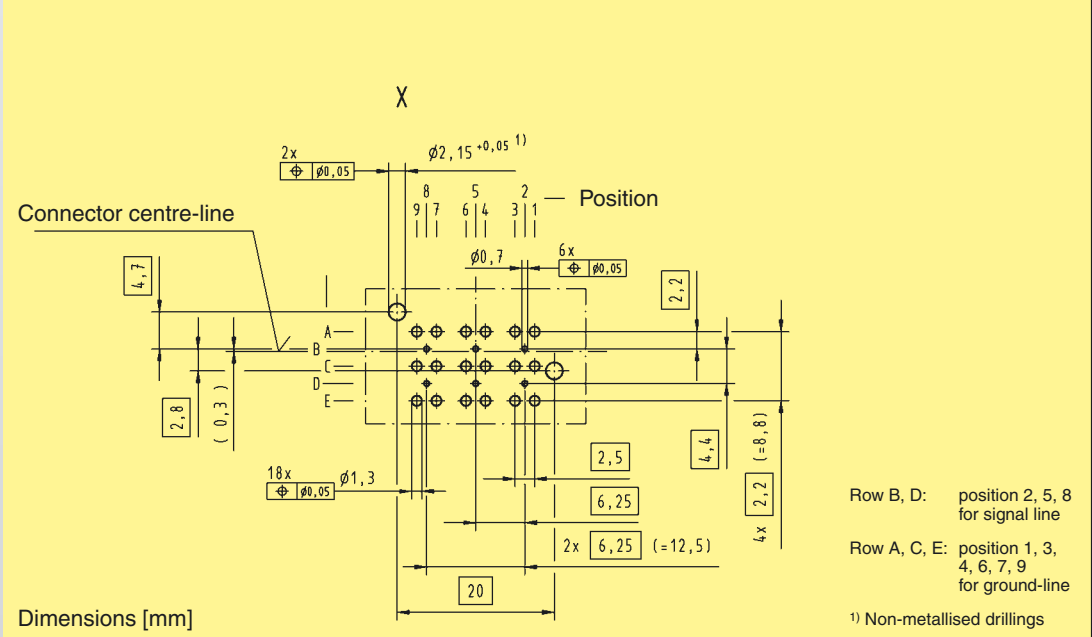
Straight modules

| Identification                      | Number of contacts | SU | loaded positions | Part number    |
|-------------------------------------|--------------------|----|------------------|----------------|
| Mini Coax+ modules, SMC termination | 6                  | 1  | 2, 5, 8          | 07 11 100 0027 |
|                                     | 4                  | 1  | 2, 8             | 07 11 900 0032 |
|                                     | 2                  | 1  | 2                | 07 11 900 0031 |

Dimensions



Board drillings





## Identification

Mini Coax+ modules,  
SMT / SMC  
termination

Number of contacts

SU

loaded  
positions

Part number

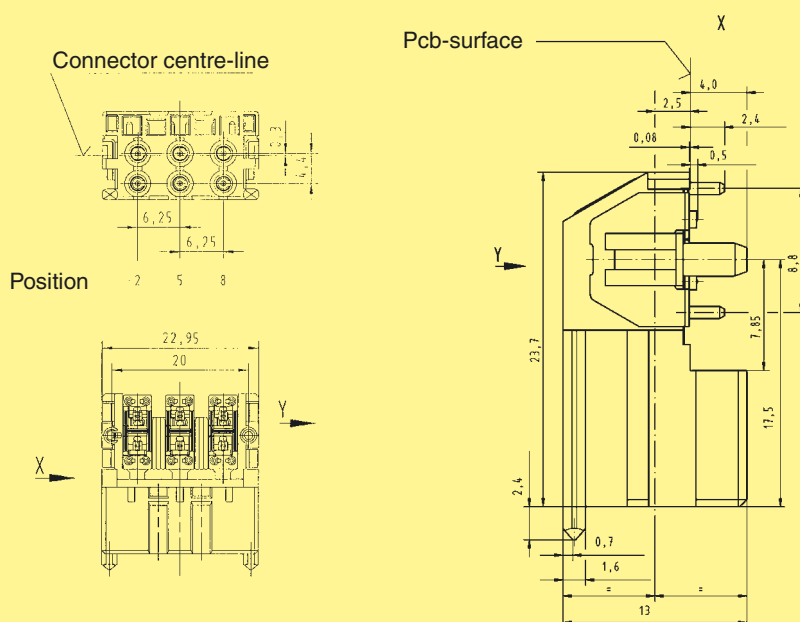
6  
4  
2

1  
1  
1

2, 5, 8  
2, 8  
2

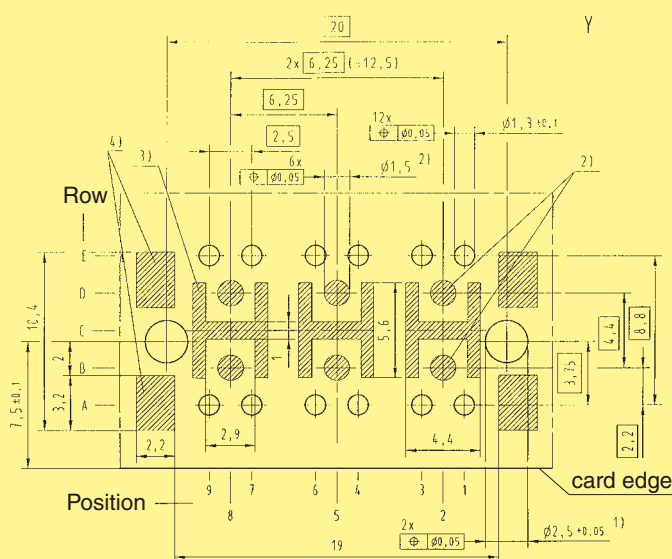
07 31 100 0023  
07 31 900 0032  
07 31 900 0031

## Dimensions



(View magnified)

## Board drillings



Dimensions [mm]

Row B, D: position 2, 5, 8  
for signal line

Row A, C, E: position 1, 3, 4, 6, 7, 9  
for ground-line

### 1) Non-metallised drillings

2) Solder pad for signal-line

3) Solder pad for ground-line

4) Solder pad for fixing anchor

**har-link®** Modular metric high speed connectors

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| <b>har-link®</b> connector system – general information ..... | <b>12.02</b> |
| Technical characteristics .....                               | <b>12.04</b> |
| Male and female connectors .....                              | <b>12.05</b> |
| Accessories .....                                             | <b>12.06</b> |



The **har-link®** connector system of HARTING complies with the requirements of IEC 61076-4-107 and is a compact and robust pcb-to-cable interface with excellent data transmission properties for high-speed networking and telecommunications.

All dimensions of the **har-link®** connector are in accordance with IEC 917 and IEEE P 1301 requirements, which allows for easy implementation into both metric and inch-based systems. In addition, **har-link®** supports hot plugging as required by modern bus systems such as CompactPCI, S-bus and VME.

**har-link®** allows data transmission up to 2 Gbit/s per pair and is therefore perfectly suited for modern transmission protocols such as Low Voltage Differential Signals (see Fig. 1). The design of the **har-link®** connector allows differential pairs to be placed horizontally (parallel to the pcb), thus reducing the skew at high frequencies and considering high signal integrity.

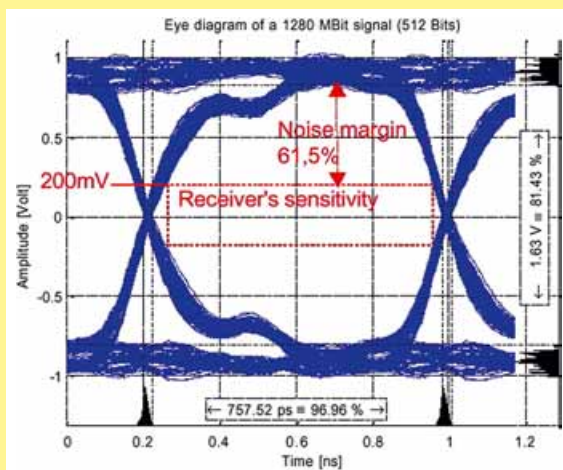


Fig. 1: Eye diagram of a 1280 MBit signal (512 Bits)

The metal shells of the **har-link®** connector are a guarantee for its superior performance in the EMI-polluted environment (see Fig. 2).



Fig. 2: 360° screened-can construction with locking levers

To reach a screening attenuation of more than 50 dB up to 1 GHz, HARTING offers brackets covering each connector in conjunction with a gasket, which is compressed between the bracket and the front panel (see Fig. 3).

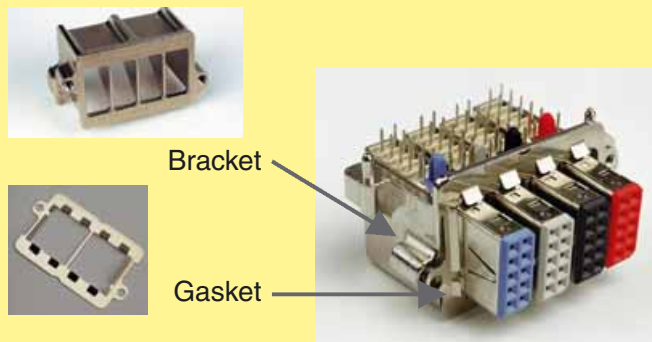


Fig. 3: 4 cavities bracket and gasket

Once plugged, the mated pair shows excellent mating safety. Due to the locking levers on both sides of the male connector, the connection withstands a pulling force of up to 80 N (see Fig. 2).

The high temperature resistant material of the **har-link®** female connector body supports the safe reflow soldering process. For easy identification of female modules, six different colours are available (see Fig. 4).

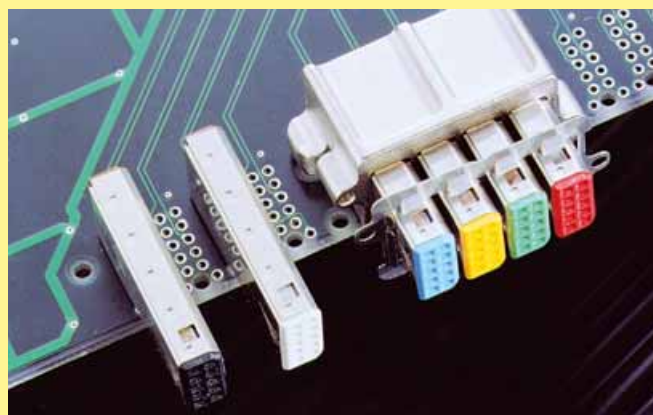


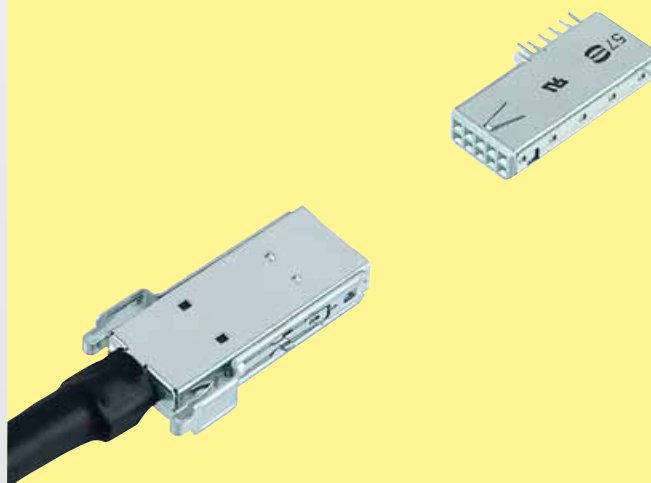
Fig. 4: Differently coloured female modules

In addition to single connectors, HARTING provides cable assemblies with unshielded twisted pairs or with shielded twisted pairs for high speed applications such as IEEE 1355. A crimping tool range for terminating the male **har-link®** connectors is available.





|                                              |                                                                                                                                         |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Kontaktzahlen                                | 10                                                                                                                                      |
| Freigaben                                    | IEC 61 076-4-107<br>UL approbiert: E102079                                                                                              |
| Anschlussraster<br>Steckverbinderraster      | 2 mm<br>6 mm                                                                                                                            |
| Betriebsstrom                                | 1,5 A bei 70 °C                                                                                                                         |
| Prüfspannung U <sub>eff</sub>                | 750 V                                                                                                                                   |
| Durchgangswiderstand<br>Isolationswiderstand | ≤ 30 mΩ<br>≥ 10 <sup>10</sup> Ω                                                                                                         |
| Temperaturbereich<br>beim Reflowlöten        | -55 °C ... + 125 °C<br>Federleiste:<br>max. + 260 °C für 60 s                                                                           |
| Steckzyklen                                  | 250, Anforderungsstufe 2                                                                                                                |
| Anschlüsse                                   | Schneidklemmanschluss<br>(Messerleiste), AWG 28/7 -<br>30/7, AWG 30 massiv<br>Einlötlötlöte für Bohrloch<br>ø 0,6 mm min. (Federleiste) |
| Steckkraft<br>Haltekraft                     | 10 N max. / Modul<br>2 N min. / Modul<br>(ohne Rasthebel)                                                                               |
| Verrastung                                   | Rasthebel                                                                                                                               |
| Werkstoffe                                   |                                                                                                                                         |
| Isolierkörper                                | Messerleiste: Polyester,<br>UL 94-V0<br>Federleisten: Hochtempera-<br>turformstoff, UL 94-V0                                            |
| Kontaktelemente                              | Kupferlegierung                                                                                                                         |
| Gehäuse                                      | Messerleiste: Edelstahl<br>Federleisten:<br>Nickel Silber                                                                               |
| Kontaktoberfläche                            | <u>Kontaktbereich:</u><br>Selektiv vergoldet<br><u>Anschlussbereich:</u> verzinkt                                                       |



Male connectors, straight  
Female connectors, angled



Identification

No. of  
contacts

Colour

Part No.

Male connector  
for insulation displacement

10

Black

27 11 161 8001

Female connector  
with solder pins

10

Beige (standard)

27 21 121 8000

10

Red

27 21 121 8002

10

Yellow

27 21 121 8004

10

Green

27 21 121 8005

10

Blue

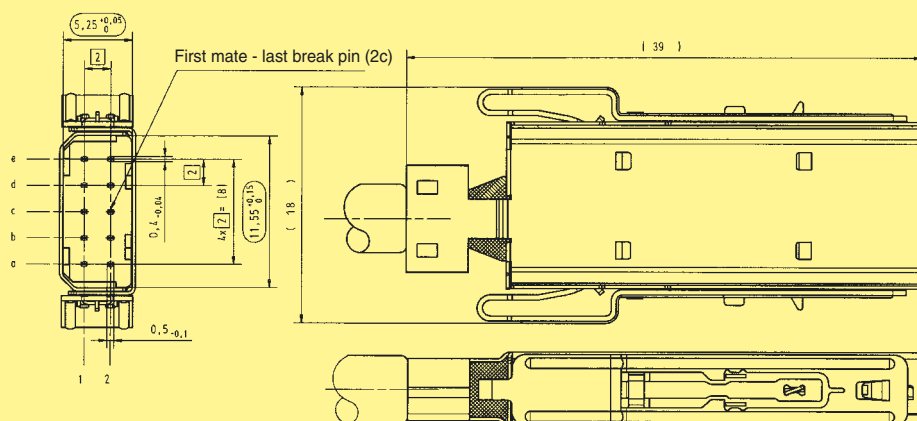
27 21 121 8006

10

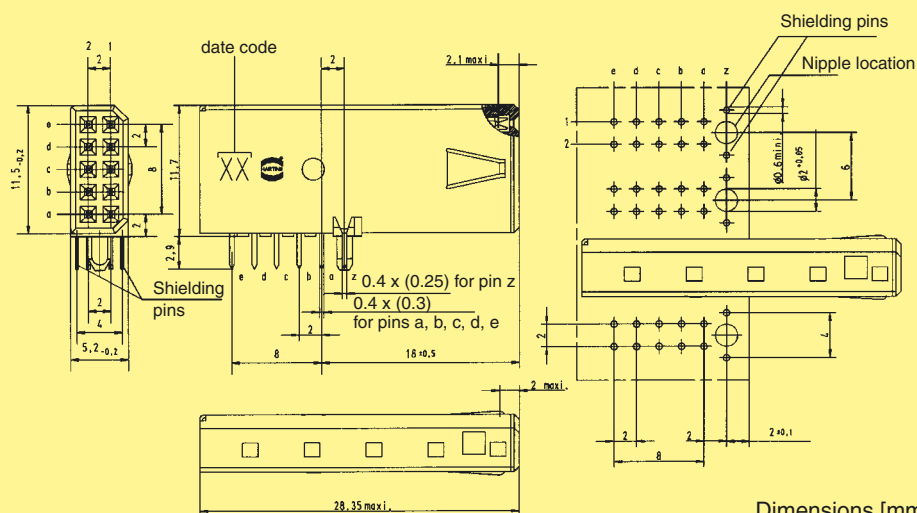
Black

27 21 121 8010

Male connector



Female connector



Dimensions [mm]

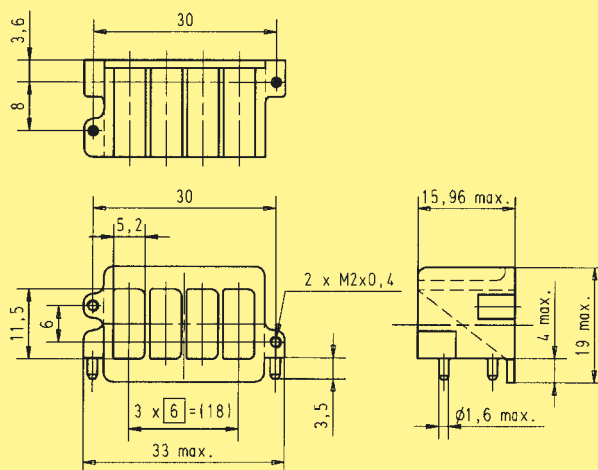


## Accessories

| Identification | Part No. | Drawing | Dimensions [mm] |
|----------------|----------|---------|-----------------|
|----------------|----------|---------|-----------------|

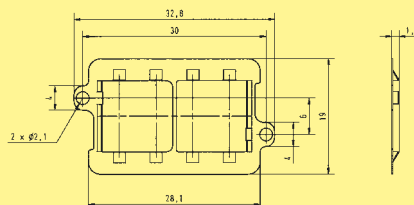
Bracket  
with four cavities

27 71 040 0001



Gasket  
with four cavities

27 71 040 0002



## Tooling / Press-in technology

Page

**harbus<sup>®</sup> HM**

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**Mini Coax**

|                                                     |       |
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| Discrete tooling system for volume production ..... | 15.09 |
|-----------------------------------------------------|-------|

**harpak<sup>®</sup>**

|                                                     |       |
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**Press-in machines**

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| Quality assurance press-in process .....                | 15.21 |

<sup>1)</sup> See separate catalogue

For economical and safe press-in of *har-bus® HM* connectors with 5+2 and 8+2 rows, HARTING has developed a discrete tooling system.

Due to its modular structure it can be adapted to any connector configuration that needs to be pressed-in extremely quickly and securely.

Therefore a top and a bottom tool for each connector style is available. These tools are inserted in a top or bottom carrier tool with a groove, thus guaranteeing exact position of the top and bottom tools and the connectors.

To use identical carrier tools for all connector configurations, HARTING offer spacer blocks to fill gaps between adjacent top or bottom tools.

The carrier tool is either completely filled with top or bottom tools or respective spacer blocks, making it possible to press-in single modules.

To press-in female connectors with pre-installed upper shields, separate top and bottom tools are available.

For lower shield press-in the tooling can be changed easily.

For further information please check our operating instructions or contact your HARTING representative.

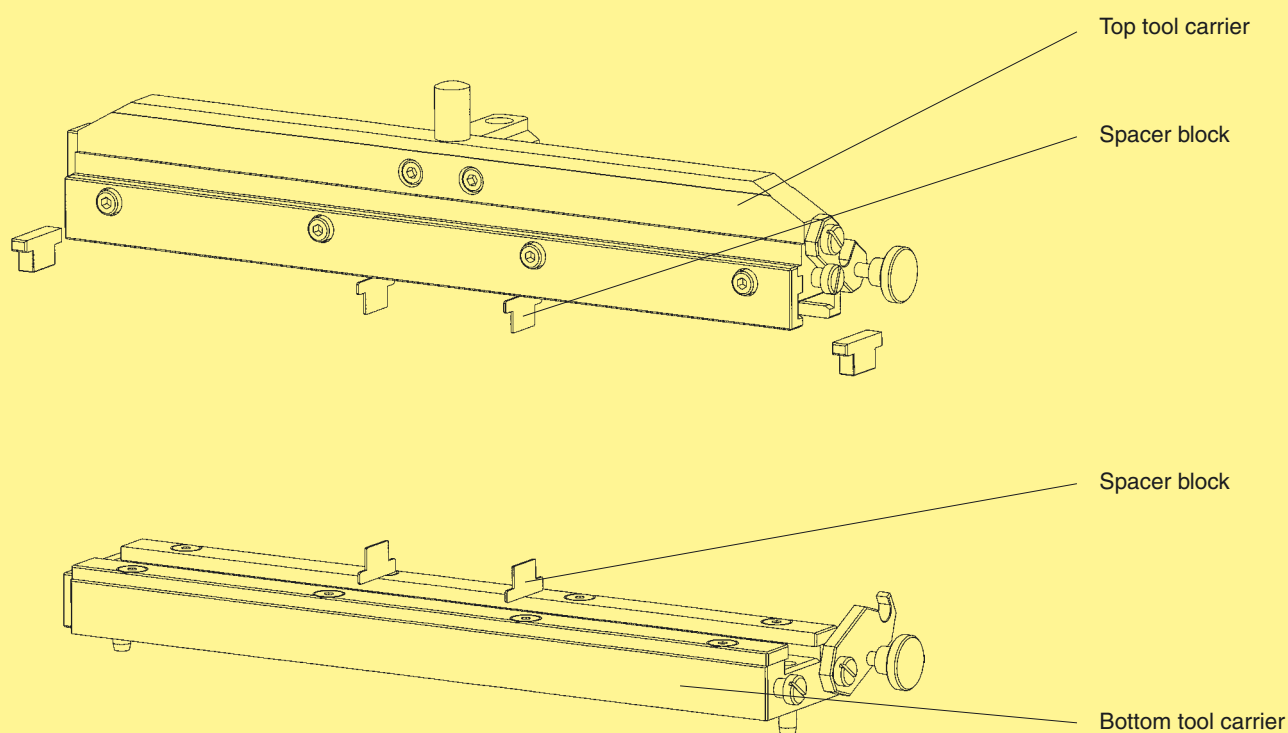


Fig. 1: Basis tools of the discrete tooling system

## Basis tools for all connector types

| Tooling | Part number connector | Tool identification                       | Part number tool | Part number connector | Tool identification          | Part number tool |
|---------|-----------------------|-------------------------------------------|------------------|-----------------------|------------------------------|------------------|
|         |                       |                                           |                  |                       |                              |                  |
|         | 17 xx xxx xxxx        | Top tool carrier <i>har-bus® HM</i>       | 17 99 000 0012   | 17 xx xxx xxxx        | Spacer block 25 mm           | 17 99 000 0055   |
|         | 17 xx xxx xxxx        | Bottom tool carrier <i>har-bus® HM</i>    | 17 99 000 0013   | 17 xx xxx xxxx        | Spacer block 38 mm           | 17 99 000 0054   |
|         | 17 xx xxx xxxx        | Top tool carrier <i>har-bus® HM 3U</i>    | 17 99 000 0073   | 17 xx xxx xxxx        | Spacer block 44 mm           | 17 99 000 0053   |
|         | 17 xx xxx xxxx        | Bottom tool carrier <i>har-bus® HM 3U</i> | 17 99 000 0074   | 17 xx xxx xxxx        | Spacer block 50 mm           | 17 99 000 0052   |
|         | 17 xx xxx xxxx        | Spacer block 0.67 mm (CompactPCI)         | 17 99 000 0057   | 17 xx xxx xxxx        | Centering plate female left  | 17 99 000 0060   |
|         | 17 xx xxx xxxx        | Spacer block 5 mm                         | 17 99 000 0056   | 17 xx xxx xxxx        | Centering plate female right | 17 99 000 0061   |



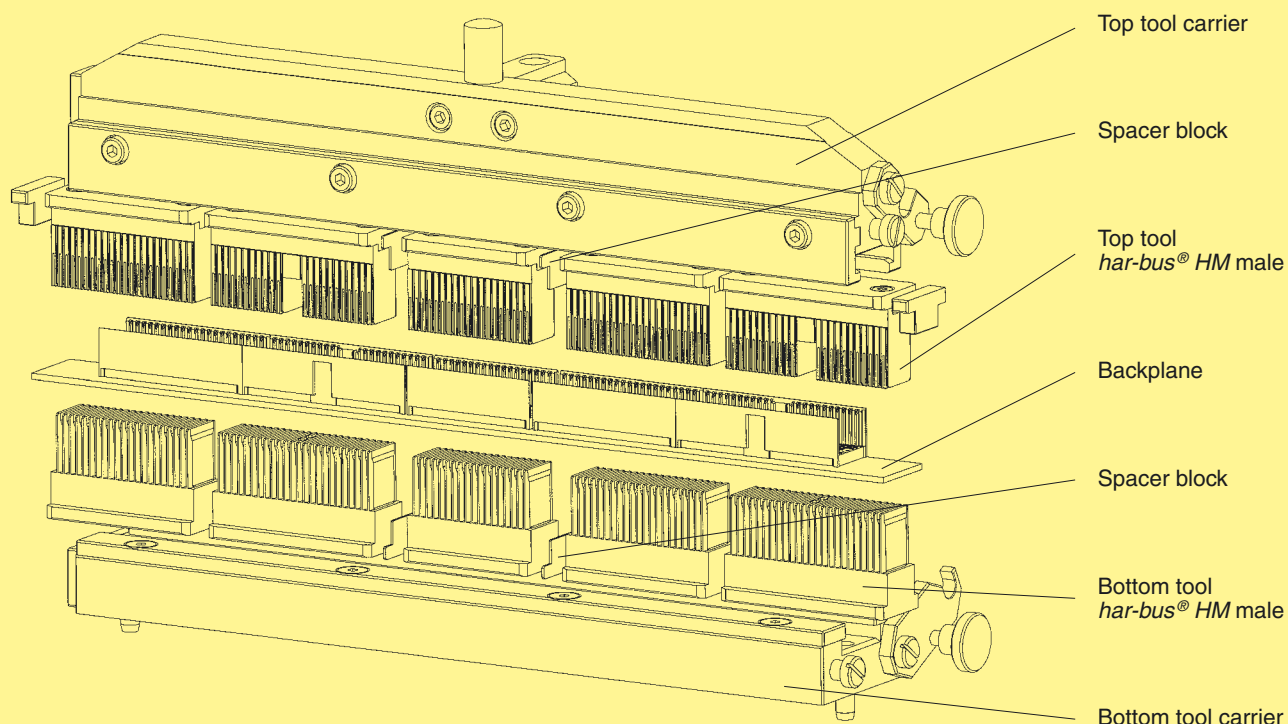


Fig. 2: Configuration sample for 6U backplane

### Tools for straight male connectors

| Part number connector | Tool identification       | Part number tool | Part number connector | Tool identification        | Part number tool |
|-----------------------|---------------------------|------------------|-----------------------|----------------------------|------------------|
| 17 01 xxx xxxx        | Top tool, male, type A    | 17 99 000 0014   | 17 11 xxx xxxx        | Top tool, male, type D     | 17 99 000 0022   |
| 17 01 xxx xxxx        | Bottom tool, male, type A | 17 99 000 0026   | 17 11 xxx xxxx        | Bottom tool, male, type D  | 17 99 000 0028   |
| 17 02 xxx xxxx        | Top tool, male, type B    | 17 99 000 0020   | 17 12 xxx xxxx        | Top tool, male, type E     | 17 99 000 0023   |
| 17 02 xxx xxxx        | Bottom tool, male, type B | 17 99 000 0026   | 17 12 xxx xxxx        | Bottom tool, male, type E  | 17 99 000 0028   |
| 17 04 xxx xxxx        | Top tool, male, type B    | 17 99 000 0019   | 17 13 xxx xxxx        | Top tool, male, type AB    | 17 99 000 0015   |
| 17 04 xxx xxxx        | Bottom tool, male, type B | 17 99 000 0025   | 17 13 xxx xxxx        | Bottom tool, male, type AB | 17 99 000 0024   |
| 17 05 xxx xxxx        | Top tool, male, type B    | 17 99 000 0018   | 17 14 xxx xxxx        | Top tool, male, type AB    | 17 99 000 0016   |
| 17 05 xxx xxxx        | Bottom tool, male, type B | 17 99 000 0024   | 17 14 xxx xxxx        | Bottom tool, male, type AB | 17 99 000 0025   |
| 17 03 xxx xxxx        | Top tool, male, type C    | 17 99 000 0021   | 17 15 xxx xxxx        | Top tool, male, type AB    | 17 99 000 0017   |
| 17 03 xxx xxxx        | Bottom tool, male, type C | 17 99 000 0027   | 17 15 xxx xxxx        | Bottom tool, male, type AB | 17 99 000 0026   |



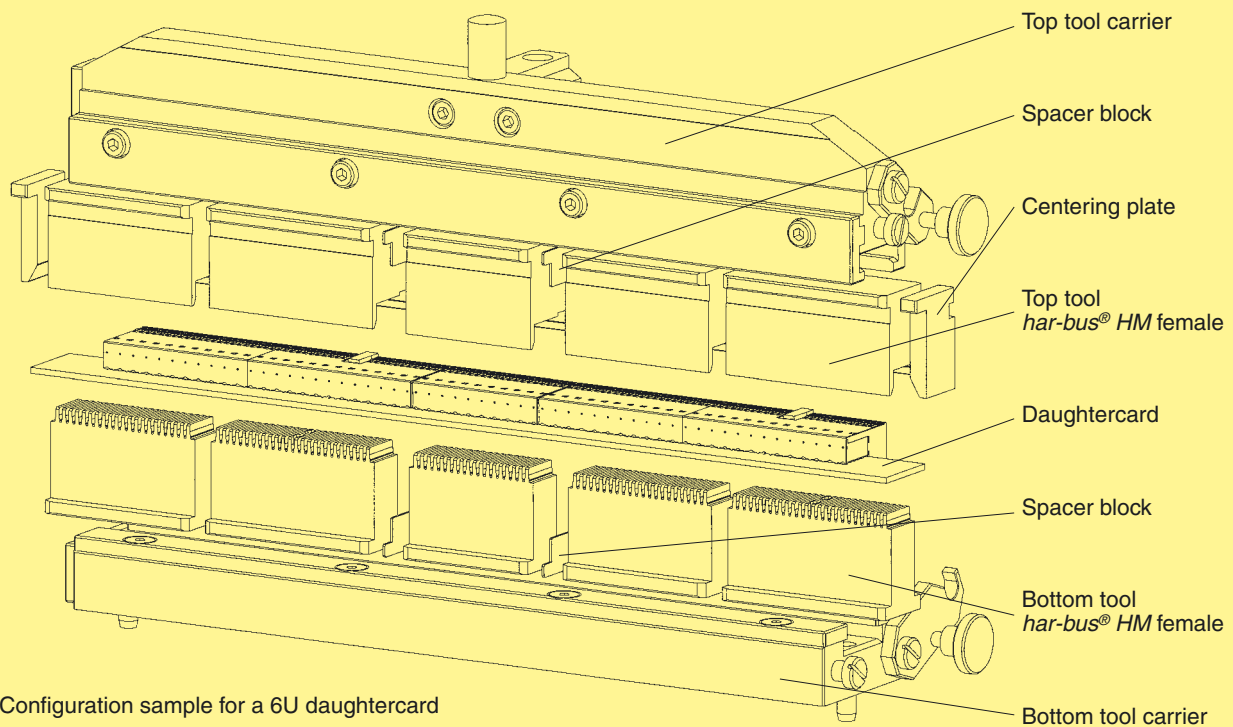


Fig. 3: Configuration sample for a 6U daughtercard

### Tools for angled female connectors

| Part number connector | Tool identification         | Part number tool | Part number connector | Tool identification          | Part number tool |
|-----------------------|-----------------------------|------------------|-----------------------|------------------------------|------------------|
| 17 21 xxx xxxx        | Top tool, female, type A    | 17 99 000 0029   | 17 31 xxx xxxx        | Top tool, female, type D     | 17 99 000 0042   |
| 17 21 xxx xxxx        | Bottom tool, female, type A | 17 99 000 0046   | 17 31 xxx xxxx        | Bottom tool, female, type D  | 17 99 000 0048   |
| 17 22 xxx xxxx        | Top tool, female, type B    | 17 99 000 0038   | 17 32 xxx xxxx        | Top tool, female, type E     | 17 99 000 0042   |
| 17 22 xxx xxxx        | Bottom tool, female, type B | 17 99 000 0046   | 17 32 xxx xxxx        | Bottom tool, female, type E  | 17 99 000 0048   |
| 17 24 xxx xxxx        | Top tool, female, type B    | 17 99 000 0036   | 17 33 xxx xxxx        | Top tool, female, type AB    | 17 99 000 0032   |
| 17 24 xxx xxxx        | Bottom tool, female, type B | 17 99 000 0045   | 17 33 xxx xxxx        | Bottom tool, female, type AB | 17 99 000 0044   |
| 17 25 xxx xxxx        | Top tool, female, type B    | 17 99 000 0034   | 17 34 xxx xxxx        | Top tool, female, type AB    | 17 99 000 0058   |
| 17 25 xxx xxxx        | Bottom tool, female, type B | 17 99 000 0044   | 17 34 xxx xxxx        | Bottom tool, female, type AB | 17 99 000 0045   |
| 17 23 xxx xxxx        | Top tool, female, type C    | 17 99 000 0040   | 17 35 xxx xxxx        | Top tool, female, type AB    | 17 99 000 0029   |
| 17 23 xxx xxxx        | Bottom tool, female, type C | 17 99 000 0047   | 17 35 xxx xxxx        | Bottom tool, female, type AB | 17 99 000 0046   |

### Tools for angled shielded female connectors

| Part number connector | Tool identification                                        | Part number tool | Part number connector | Tool identification                    | Part number tool |
|-----------------------|------------------------------------------------------------|------------------|-----------------------|----------------------------------------|------------------|
| 17 21 xxx xxxx        | Top tool, female, type A upper shield                      | 17 99 000 0030   | 17 34 xxx xxxx        | Top tool, female, type AB upper shield | 17 99 000 0059   |
| 17 21 xxx xxxx        | Top tool, female, type A divided shield computer telephony | 17 99 000 0031   | 17 35 xxx xxxx        | Top tool, female, type AB upper shield | 17 99 000 0030   |
| 17 22 xxx xxxx        | Top tool, female, type B upper shield                      | 17 99 000 0039   | 17 21 xxx xxxx        | Press-in die lower shield type A       | 17 99 000 0051   |
| 17 24 xxx xxxx        | Top tool, female, type B upper shield                      | 17 99 000 0037   | 17 22 xxx xxxx        | Press-in die lower shield type B       | 17 99 000 0051   |
| 17 25 xxx xxxx        | Top tool, female, type B upper shield                      | 17 99 000 0035   | 17 24 xxx xxxx        | Press-in die lower shield type B       | 17 99 000 0050   |
| 17 23 xxx xxxx        | Top tool, female, type C upper shield                      | 17 99 000 0041   | 17 25 xxx xxxx        | Press-in die lower shield type B       | 17 99 000 0049   |
| 17 31 xxx xxxx        | Top tool, female, type D upper shield                      | 17 99 000 0043   | 17 31 xxx xxxx        | Press-in die lower shield type D       | 17 99 000 0051   |
| 17 32 xxx xxxx        | Top tool, female, type E upper shield                      | 17 99 000 0043   | 17 32 xxx xxxx        | Press-in die lower shield type E       | 17 99 000 0051   |
| 17 33 xxx xxxx        | Top tool, female, type AB upper shield                     | 17 99 000 0033   | 17 33 xxx xxxx        | Press-in die lower shield type AB      | 17 99 000 0049   |
|                       |                                                            |                  | 17 34 xxx xxxx        | Press-in die lower shield type AB      | 17 99 000 0050   |
|                       |                                                            |                  | 17 35 xxx xxxx        | Press-in die lower shield type AB      | 17 99 000 0051   |

For 6U backplanes with CompactPCI configuration, HARTING has developed this start-up tooling.

The basis is a top tool carrier with tooth inserts, that are engaged alternately.

Therefore this tooling assembly can be used without any additional set-up time.

The tooth inserts are interchangeable, so that the tooling can be used for other connector configurations as well as for CompactPCI.

The bottom tool should preferably be a loadnest, which carries and aligns the pcb.

For detailed information please contact your local HARTING representative.

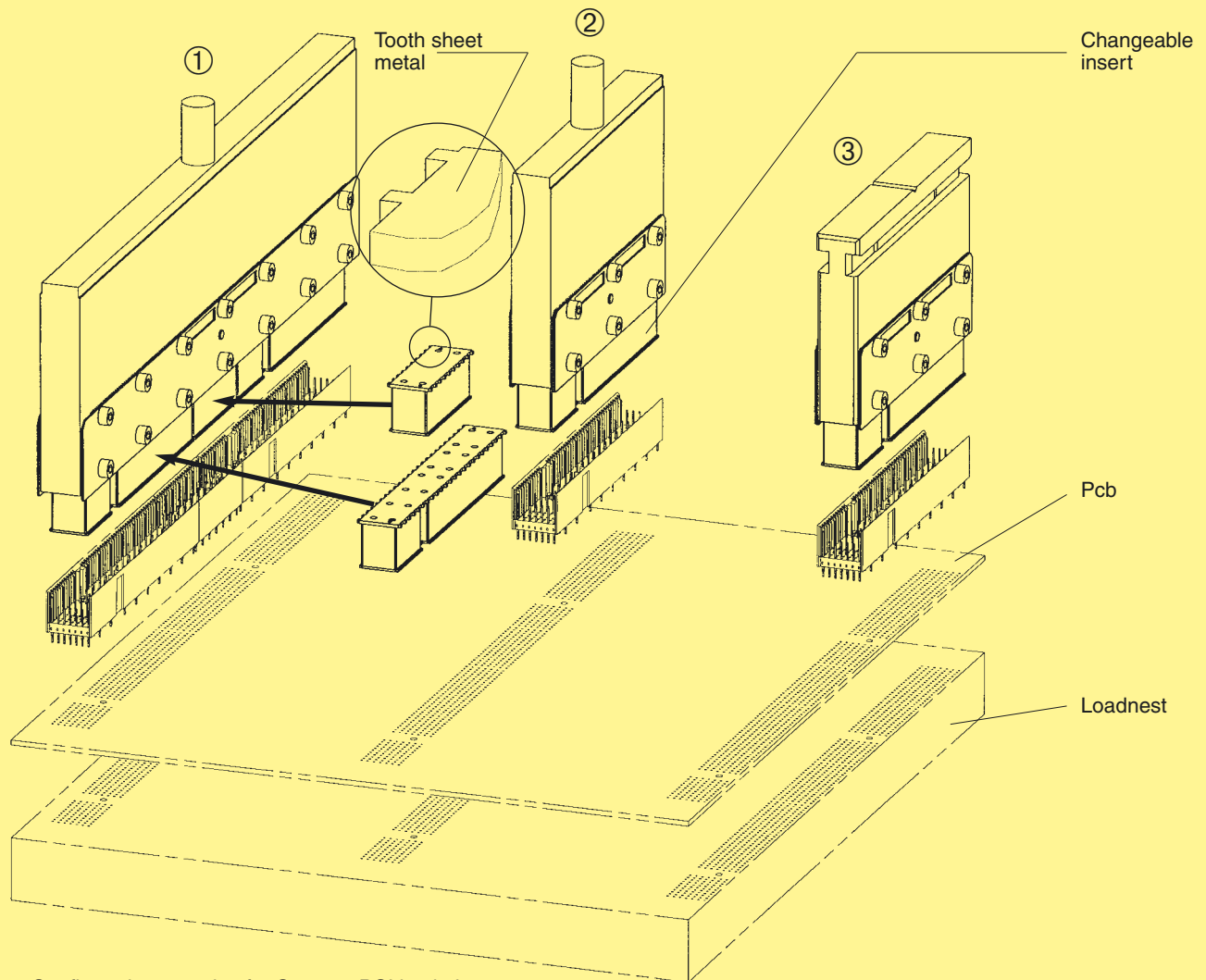


Fig. 4: Configuration samples for CompactPCI backplanes

## Tools for straight male connectors

| Tool identification                          | Part number tool | Tool identification                  | Part number tool |
|----------------------------------------------|------------------|--------------------------------------|------------------|
| ① Insert top tool for 6U CompactPCI          | 17 99 000 0063   | Tooth insert for type Monoblock 47   | 17 99 000 0066   |
| ② Insert top tool for 3U CompactPCI          | 17 99 000 0065   | Tooth insert for type B 19 positions | 17 99 000 0068   |
| ③ Insert top tool for rotatable tool changer | on request       |                                      |                  |

The insert blocks can be used to press-in *har-bus® HM* male connectors without any special top tool. These blocks will be put into the connectors manually or automatically (using insertion removal station, see page 15.16).

To press-in the connector no precise position is needed and can be done by a simple flat rock die. This will accelerate the cycle time of the press-in process dramatically.

Insert blocks are developed for use with a loadnest.

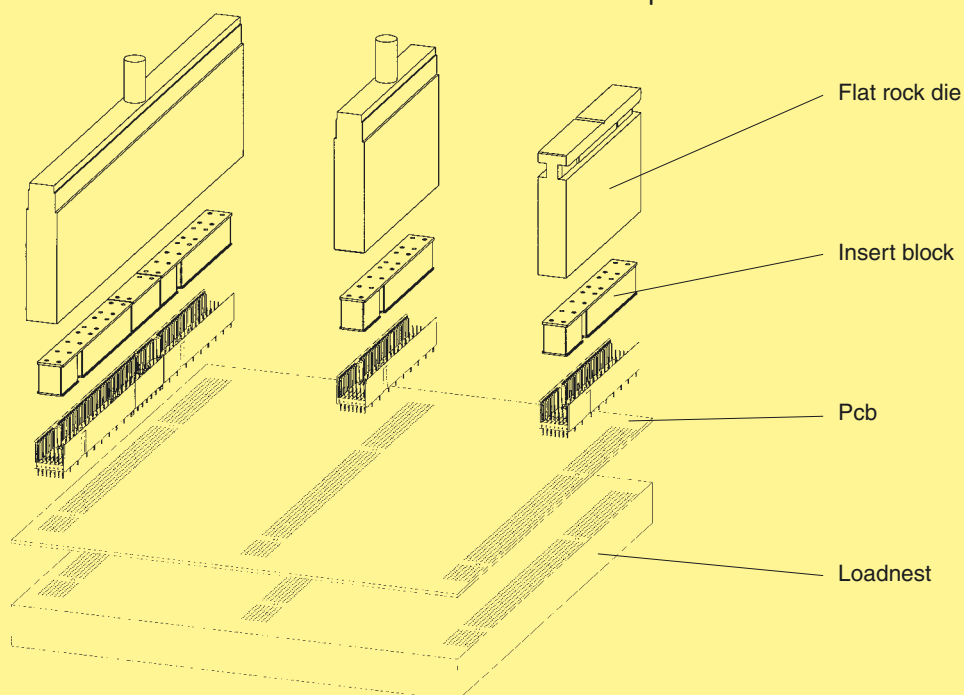


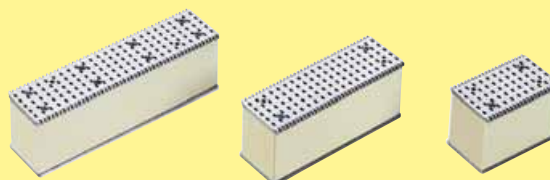
Fig. 5: Application samples for insert blocks

### Insert blocks for straight male connectors

| Part number connector | Tool identification                | Quantity and part number tool                                        |
|-----------------------|------------------------------------|----------------------------------------------------------------------|
| 17 01 xxx xxxx        | Insert block for type A            | 1 x 17 99 000 0009<br>or (2 x 17 99 000 0001)                        |
| 17 04 xxx xxxx        | Insert block for type B            | 1 x 17 99 000 0004                                                   |
| 17 05 xxx xxxx        | Insert block for type B            | 1 x 17 99 000 0002                                                   |
| 17 02 xxx xxxx        | Insert block for type B            | 1 x 17 99 000 0003                                                   |
| 17 03 xxx xxxx        | Insert block for type C            | 1 x 17 99 000 0001                                                   |
| 17 06 xxx xxxx        | Insert block for type Monoblock 47 | 1 x 17 99 000 0008<br>or (1 x 17 99 000 0001 and 1 x 17 99 000 0005) |
| 17 11 xxx xxxx        | Insert block for type D            | 2 x 17 99 000 0006                                                   |
| 17 12 xxx xxxx        | Insert block for type E            | 1 x 17 99 000 0007                                                   |
| 17 13 xxx xxxx        | Insert block for type AB           | 1 x 17 99 000 0069                                                   |
| 17 14 xxx xxxx        | Insert block for type AB           | 1 x 17 99 000 0070                                                   |
| 17 15 xxx xxxx        | Insert block for type AB           | 1 x 17 99 000 0071                                                   |
| 17 10 xxx xxxx        | Insert block for type DE           | 1 x 17 99 000 0072                                                   |

### Flat rock dies

| Part number connector | Tool identification  | Part number tool |
|-----------------------|----------------------|------------------|
| 17 xx xxx xxxx        | Flat rock die for 6U | 07 79 000 0155   |
| 17 xx xxx xxxx        | Flat rock die for 3U | 07 79 000 0156   |



The insert block 17 99 000 0001 e.g. can be used for the types A, C and Monoblock 47.

This CompactPCI tooling for 3U and 6U daughtercards is very user-friendly and minimises handling faults and costs.

It consists of a loadnest as the bottom tool and a flat rock die as the top tool.

The loadnest is adjusted to a specific customised pcb thus handling faults and set up costs are eliminated.

Implemented metal guides in the loadnest guarantee excellent pcb fixing, thus a top tool fixation is not necessary.

As consequence a standard flat rock die can be used.

We will be pleased to offer you a loadnest customised for your application.

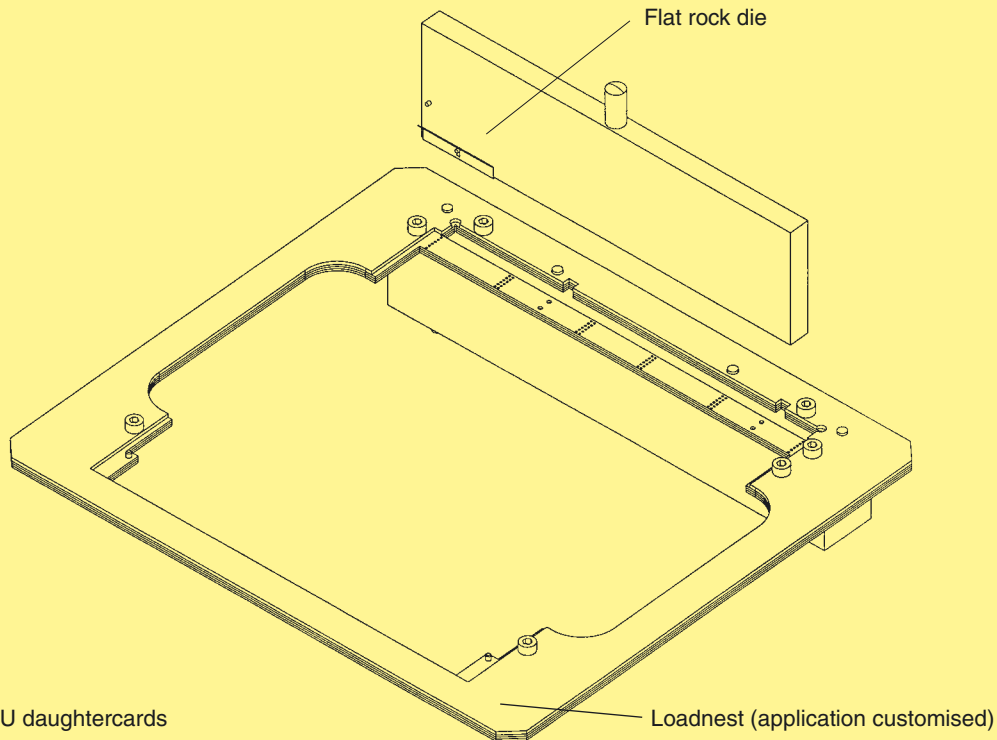


Fig. 6: Tooling for 6U daughtercards

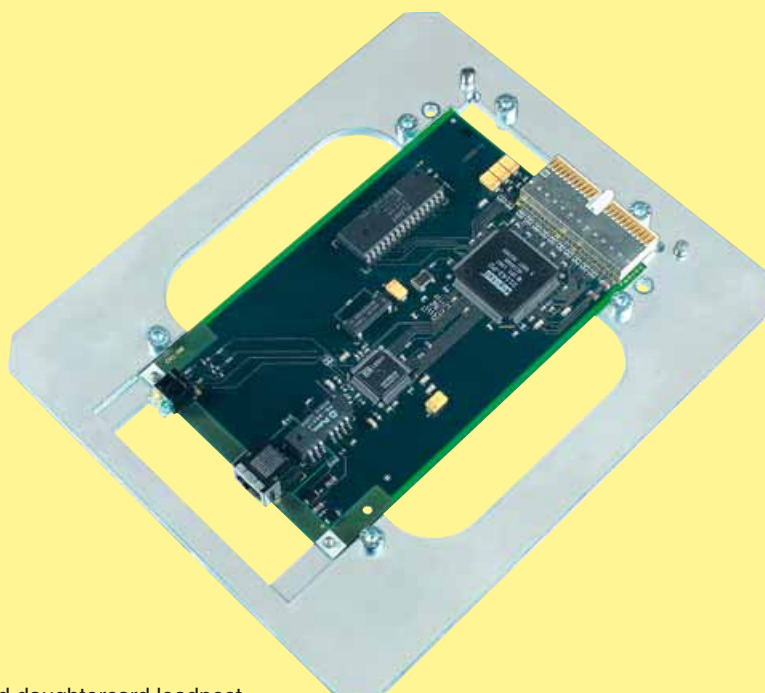
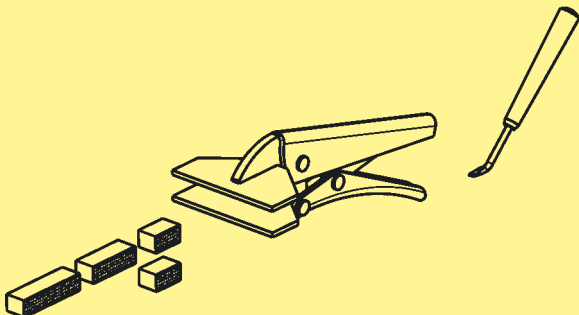
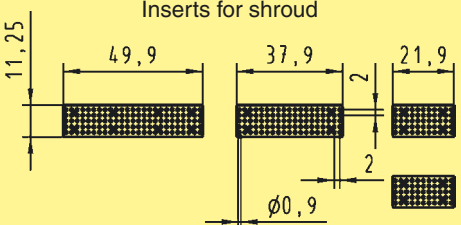
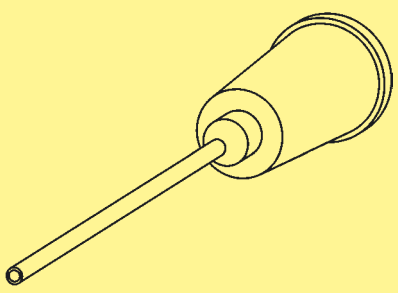
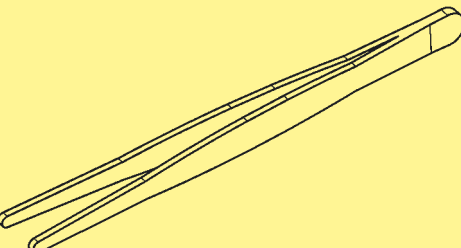


Fig. 7: Application customised daughtercard loadnest

| Identification                                  | for use with | Part number    | Drawing                                                                                                                                                                                          | Dimensions [mm] |
|-------------------------------------------------|--------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Tool kit<br>shroud removal                      | har-bus HM   | 17 99 000 0095 |  <p>Inserts for shroud</p>  |                 |
| Insertion and repair tool<br>for single contact |              | 17 99 000 0094 |                                                                                                              |                 |
| Mounting tool<br>for coding key                 |              | 17 99 000 0093 |                                                                                                              |                 |

Straight Mini Coax connectors can be pressed-in with a flat die and a top tool delivered with the connectors. This top tool can be used as contact protection and remains in the connector until the daughtercard is mated.

Angled Mini Coax connectors will be pressed-in with separate top and bottom tools, which will be mounted into a common body.

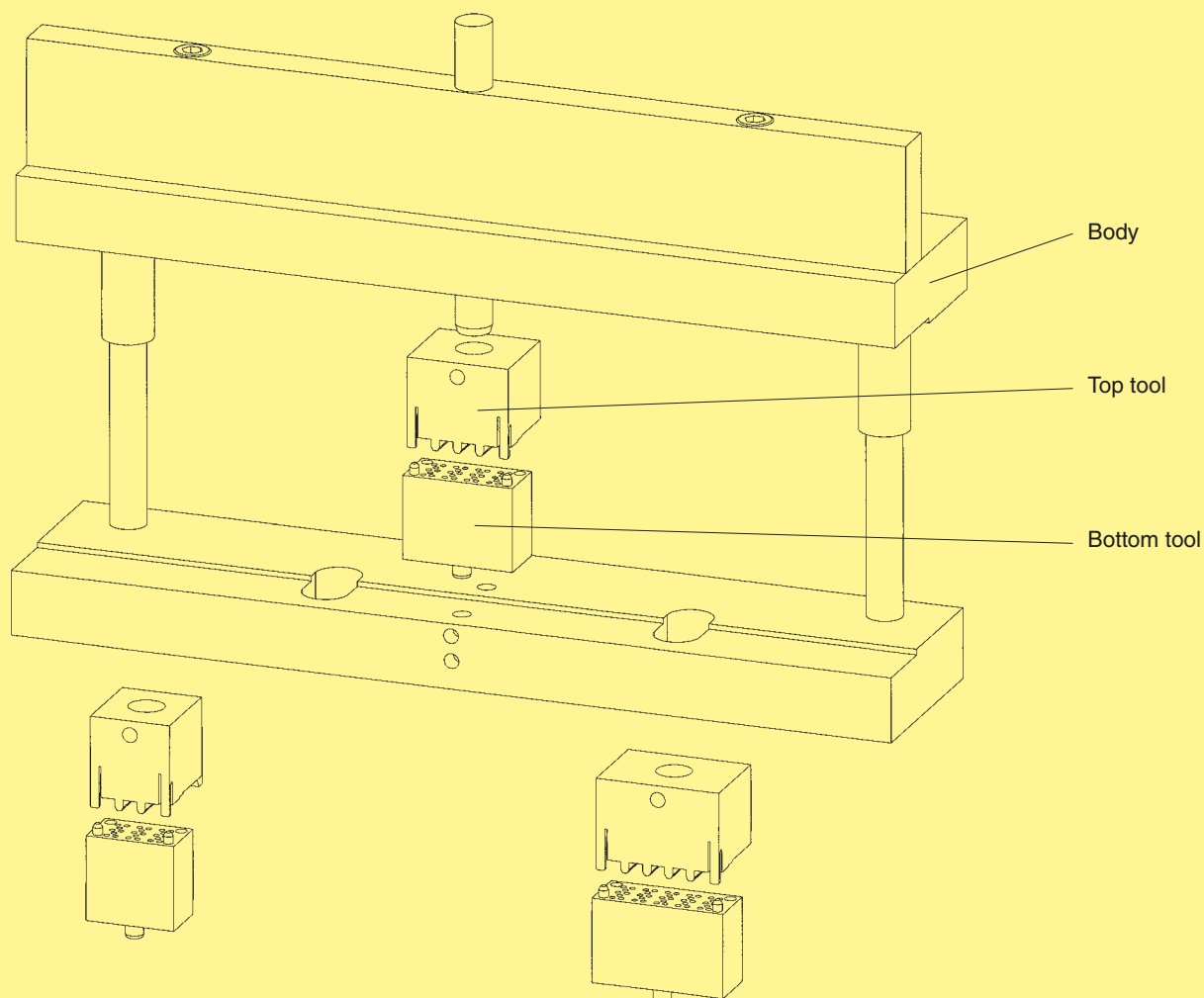


Fig. 8: Configuration for angled modules

### Tools for straight modules

| Part number connector | Tool identification           | Part number tool |
|-----------------------|-------------------------------|------------------|
| 07 11 xxx xxxx        | 1 SU Mini Coax bottom tool    | on request       |
| 07 11 xxx xxxx        | 1.25 SU Mini Coax bottom tool | on request       |
| 07 11 xxx xxxx        | 1.50 SU Mini Coax bottom tool | on request       |

### Tools for angled modules

| Part number connector | Tool identification           | Part number tool |
|-----------------------|-------------------------------|------------------|
| 07 31 xxx xxxx        | Body                          | 07 79 000 0061   |
| 07 31 xxx xxxx        | 1 SU Mini Coax bottom tool    | 07 79 000 0045   |
| 07 31 xxx xxxx        | 1 SU Mini Coax top tool       | 07 79 000 0080   |
| 07 31 xxx xxxx        | 1.25 SU Mini Coax bottom tool | 07 79 000 0034   |
| 07 31 xxx xxxx        | 1.25 SU Mini Coax top tool    | 07 79 000 0081   |
| 07 31 xxx xxxx        | 1.50 SU Mini Coax bottom tool | 07 79 000 0171   |
| 07 31 xxx xxxx        | 1.50 SU Mini Coax top tool    | 07 79 000 0170   |

For safe press-in of **har-pak®** connectors, HARTING has developed this discrete tooling system.

Due to its modular structure it can be adapted to any connector configuration that needs to be pressed-in extremely quickly and securely.

Therefore a top and a bottom tool for each connector style is available. The top tool is inserted directly into

the press and the bottom tool into a guide frame. This guide frame guarantees exact position of both the bottom tool and the pcb.

For detailed information please contact your local HARTING representative.

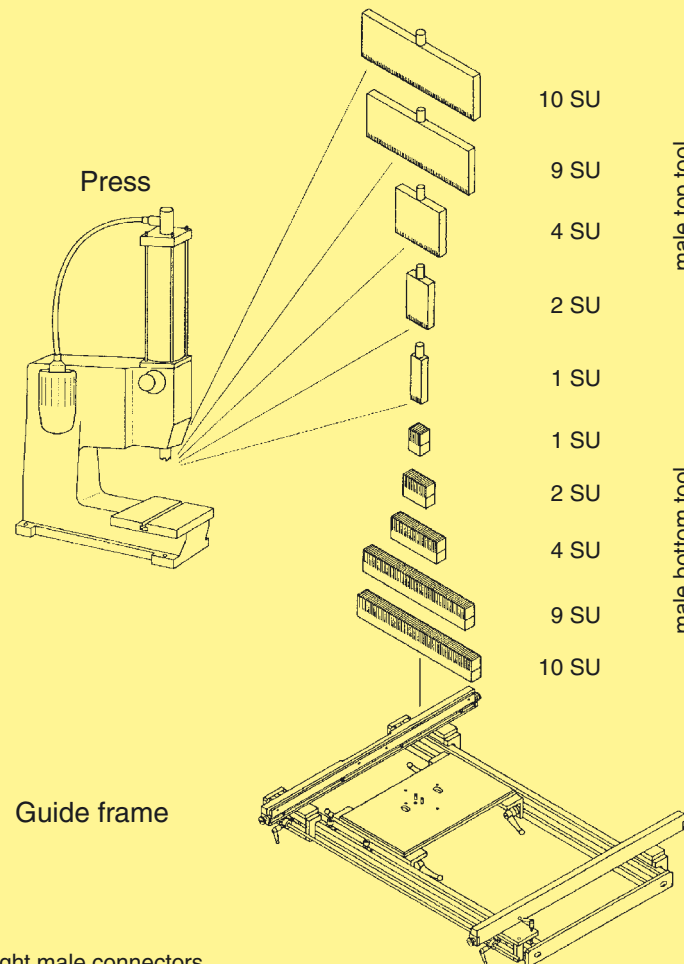


Fig. 9: Discrete tooling for straight male connectors

### Tools for straight male connectors

|          | Tools for straight male connectors |                     |                  | Tools for straight male connectors |                                         |                  |
|----------|------------------------------------|---------------------|------------------|------------------------------------|-----------------------------------------|------------------|
|          | Part number connector              | Tool identification | Part number tool | Part number connector              | Tool identification                     | Part number tool |
| Tooling  | 07 01 xxx xxxx                     | 1 SU top tool       | 07 79 000 0046   | 07 05 xxx xxxx                     | 5.4 SU top tool                         | 07 79 000 0051   |
|          | 07 01 xxx xxxx                     | 1 SU bottom tool    | 07 79 000 0055   | 07 05 xxx xxxx                     | 5.4 SU bottom tool                      | 07 79 000 0060   |
|          | 07 02 xxx xxxx                     | 2 SU top tool       | 07 79 000 0047   | 07 09 xxx xxxx                     | 9 SU top tool                           | 07 79 000 0049   |
|          | 07 02 xxx xxxx                     | 2 SU bottom tool    | 07 79 000 0056   | 07 09 xxx xxxx                     | 9 SU bottom tool                        | 07 79 000 0058   |
| 15<br>10 | 07 02 xxx xxxx                     | 2.3 SU top tool     | 07 79 000 0050   | 07 00 xxx xxxx                     | 10 SU top tool                          | 07 79 000 0052   |
|          | 07 02 xxx xxxx                     | 2.3 SU bottom tool  | 07 79 000 0059   | 07 00 xxx xxxx                     | 10 SU bottom tool                       | 07 79 000 0076   |
|          | 07 04 xxx xxxx                     | 4 SU top tool       | 07 79 000 0048   | 07 0x xxx xxxx                     | Guide frame large                       | 09 99 000 0261   |
|          | 07 04 xxx xxxx                     | 4 SU bottom tool    | 07 79 000 0057   | 07 0x xxx xxxx                     | Guide frame large for volume production | 09 99 000 0289   |



Angled **har-pak®** connectors will be pressed-in with separate lamellar and hole inserts, which will be mounted in a common body.

Implemented metal guides in the hole insert guarantee excellent pcb fixing, thus a lamellar insert fixation is not necessary.

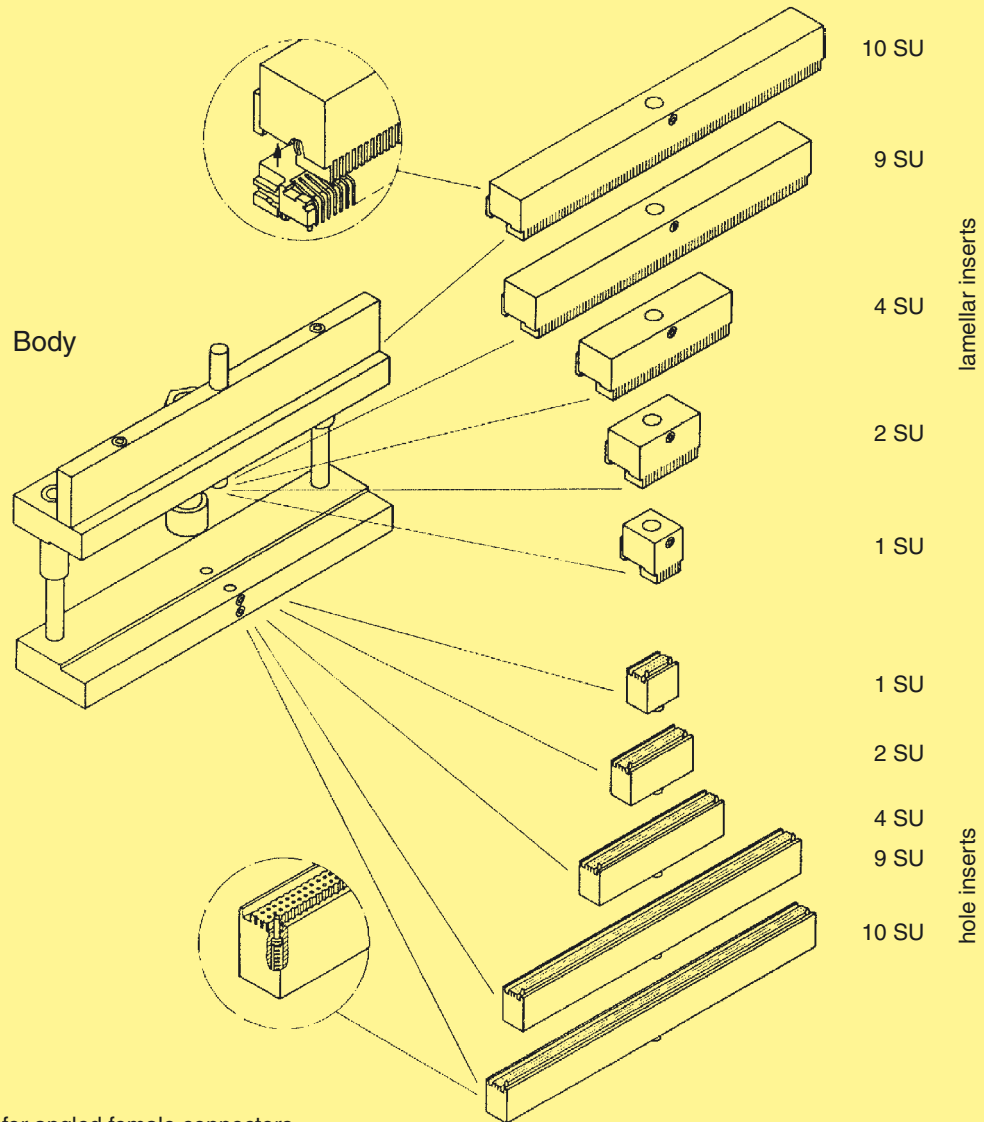


Fig. 10: Discrete tooling for angled female connectors

### Tools for angled female connectors

| Part number connector | Tool identification    | Part number tool | Part number connector | Tool identification    | Part number tool |
|-----------------------|------------------------|------------------|-----------------------|------------------------|------------------|
| 07 21 xxx xxxx        | 1 SU lamellar insert   | 07 79 000 0062   | 07 25 xxx xxxx        | 5.4 SU lamellar insert | 07 79 000 0031   |
| 07 21 xxx xxxx        | 1 SU hole insert       | 07 79 000 0070   | 07 25 xxx xxxx        | 5.4 SU hole insert     | 07 79 000 0032   |
| 07 22 xxx xxxx        | 2 SU lamellar insert   | 07 79 000 0063   | 07 29 xxx xxxx        | 9 SU lamellar insert   | 07 79 000 0065   |
| 07 22 xxx xxxx        | 2 SU hole insert       | 07 79 000 0071   | 07 29 xxx xxxx        | 9 SU hole insert       | 07 79 000 0073   |
| 07 22 xxx xxxx        | 2.3 SU lamellar insert | 07 79 000 0029   | 07 20 xxx xxxx        | 10 SU lamellar insert  | 07 79 000 0066   |
| 07 22 xxx xxxx        | 2.3 SU hole insert     | 07 79 000 0030   | 07 20 xxx xxxx        | 10 SU hole insert      | 07 79 000 0074   |
| 07 24 xxx xxxx        | 4 SU lamellar insert   | 07 79 000 0064   | 07 2x xxx xxxx        | Body 1-10 SU           | 07 79 000 0061   |
| 07 24 xxx xxxx        | 4 SU hole insert       | 07 79 000 0072   |                       |                        |                  |

The insert blocks can be used to press-in **har-pak®** male connectors without any special top tool.

These blocks will be put into the connector manually or automatically (using insertion removal station, see page 15.16).

To press-in the connector no precise position is needed and can be done by a simple flat rock die. This will accelerate the cycle time of the press-in process dramatically.

Insert blocks are developed for use with a loadnest.

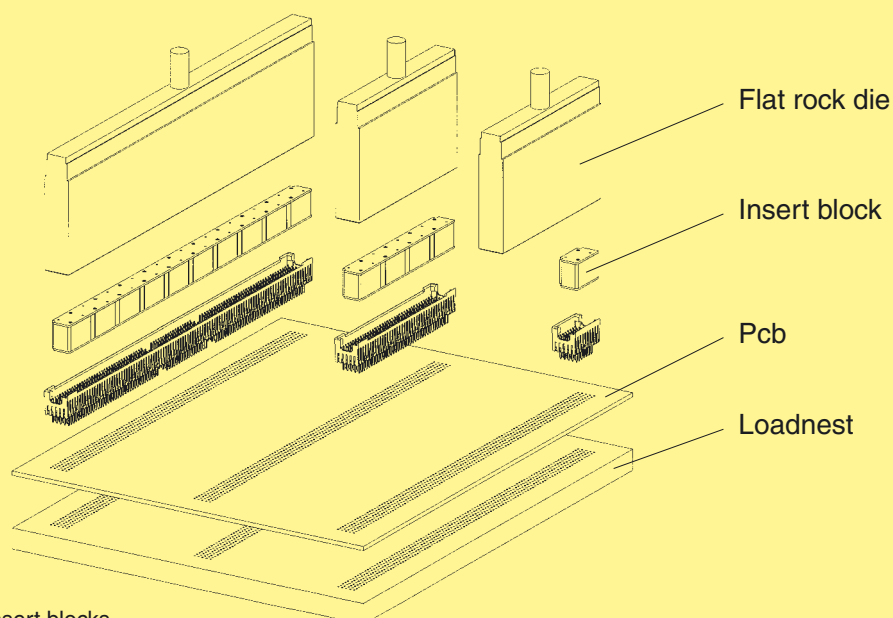


Fig. 11: Application samples for insert blocks

### Insert blocks for straight male connectors

| Part number connector | Tool identification     | Part number tool |
|-----------------------|-------------------------|------------------|
| 07 01 xxx xxxx        | Insert block for 1 SU   | 07 79 000 0116   |
| 07 02 xxx xxxx        | Insert block for 2 SU   | 07 79 000 0119   |
| 07 02 xxx xxxx        | Insert block for 2.3 SU | 07 79 000 0122   |
| 07 04 xxx xxxx        | Insert block for 4 SU   | 07 79 000 0125   |
| 07 05 xxx xxxx        | Insert block for 5.4 SU | 07 79 000 0128   |
| 07 09 xxx xxxx        | Insert block for 9 SU   | 07 79 000 0131   |
| 07 00 xxx xxxx        | Insert block for 10 SU  | 07 79 000 0134   |

### Flat rock dies

| Part number connector | Tool identification         | Part number tool |
|-----------------------|-----------------------------|------------------|
| 07 0x xxx xxxx        | Flat rock die for 1-4 SU    | 07 79 000 0156   |
| 07 0x xxx xxxx        | Flat rock die for 5.4-10 SU | 07 79 000 0155   |

### Repair and removal tools for straight male connectors

| Part number connector | Tool identification                            | Part number tool |
|-----------------------|------------------------------------------------|------------------|
| 07 0x xxx xxxx        | Press-in tool for male contacts (repair tool)  | 07 79 000 0040   |
| 07 0x xxx xxxx        | Removal tool for male contacts length 6.0 mm   | 07 79 000 0041   |
| 07 0x xxx xxxx        | Removal tool for male contacts length > 6.0 mm | 07 79 000 0042   |

15  
13

2) not suitable for hand bench press

## CPM 2001/s - press-in machine with a graphical user interface

The CPM 2001/s is the latest state of the art press-in machine. Optimised for pressing-in components into both daughter cards and backplanes, the machine is fully programmable and offers greater flexibility with a shorter set up time.

Different component heights can be stored and recalled later by simply using the “go/press” button. A TFT flat screen with Windows™ based software continuously displays all relevant information to the operator (connector position on the pcb, press-in forces etc.), thus consequently eliminating errors. A barcode reader recognises all pcb data and corresponding process programmes. Companies with multiple manufacturing sites can continuously equip and update machines with the latest programmes developed by specialists at their headquarters. The reliable and unique press-in method „autosense“ offers outstanding security for processes, as pcb tolerances and connector types are recognised and taken into consideration automatically.

CPM 2001/s



**Part No. 09 89 030 0000**

### Technical characteristics

|                     |                                     |
|---------------------|-------------------------------------|
| Drive               | electromechanical                   |
| Press-in force      | 100 kN                              |
| max. pcb dimensions | 600 x 1000 mm                       |
| Floor space         | 1200 x 960 mm                       |
| Height              | 2150 mm                             |
| Weight              | 950 kg                              |
| Power supply        | 380 / 400 / 415 V<br>3 phases, 16 A |
| Consumption         | < 1 kW                              |
| Colour              | RAL 7038                            |

Fig. 12: **CPM 2001/s** incl. PC, control software, barcode reader, keyboard, touch screen

### Equipment:

- PC incl. Win95™ with control software to store and manage all programs and process data
- Barcode scanner for management ease of press-in programs
- Touch screen for a direct user interface

### Process control:

- Continuous recording of press-in force and press-in distance data
- Press-in method “autosense”
- Automated recording and imaging of all process data, as well as process interruption at non compliant force values
- User guidance through pictures
- Clear assignment of pcb and process data

### Options:

- Rotatable tool changer
- Insertion removal station

## The **CPM prestige** press-in machine with a graphical user interface

The **CPM prestige** is a consequential development of the successful CPM 2001 press-in machines. The excellent design, supported by a wide range of tools presents a convenient, easy and comfortable way of populating backplanes and daughtercards. The machine is fully programmable and is supplied with a graphical user interface for control and visualisation of the complete process.

The use of a microprocessor control allows the recognition and storage of different component heights, so that the pressing-in of different components is initiated simultaneously with only one button.

The user-friendly touch-screen guides the user through the menu-orientated process controls. The visualisation of the entire press-in process (the position of the connector, press-in forces etc.) allows the rapid recognition and eradication of the possible error sources. With the addition of a barcode reader (1D and 2D) the parameters of every pcb layout can be stored, recalled and loaded into the automated press-in programme. The extensive operation monitor functions simplify the service and support of the machine.

The machine employs the automatic switch-off system "autosense", known worldwide for its reliability. The different connector types and the tolerances of the pcb are automatically recognised and taken into consideration at the press-in operation, thus maximising the process security.



**Part No.**

**09 89 040 0000**

### Technical characteristics

|                     |                           |
|---------------------|---------------------------|
| Drive               | electro-mechanical, servo |
| Press-in force      | 100 kN                    |
| max. pcb dimensions | 600 x 1000 mm             |
| Floor space         | 1200 x 1150 mm            |
| Weight              | 980 kg                    |
| Power supply        | 208 / 380 / 400 / 415 V   |
| Consumption         | < 1 kW                    |
| Colour              | on request                |

Fig. 13: **CPM prestige**

(incl. PC, control software, barcode reader, keyboard, touch screen)

### Features:

- Guiding rails for the secure positioning of the pcb
- Touch-screen and Industrial PC with UPS (uninterruptable power supply)
- Barcode reader for management ease of press-in programs
- All dimensions allow an easy integration into production lines

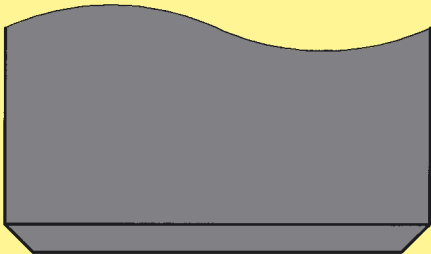
### Process monitoring and quality assurance:

- Touch screen interface with graphical and verbal menus for all machine functions
- Autosense: automated press-in interruption at incorrect press-in forces
- Storage and validation of all press-in parameters via quality assurance software (press-in force tolerances)
- Continuous high-precision measurement and recording of press-in forces and distances
- Remote determination of errors and maintenance
- High flexibility through a modular tool range

### Options:

- Rotatable tool changer
- Insertion removal station

Today nearly all female connectors are designed for flat rock tooling. For every type of male connector specific tooling and a high degree of X-Y-process accuracy is required. Therefore HARTING offers press-in insert blocks that transfer all well known assembling advantages from female connectors to male headers.

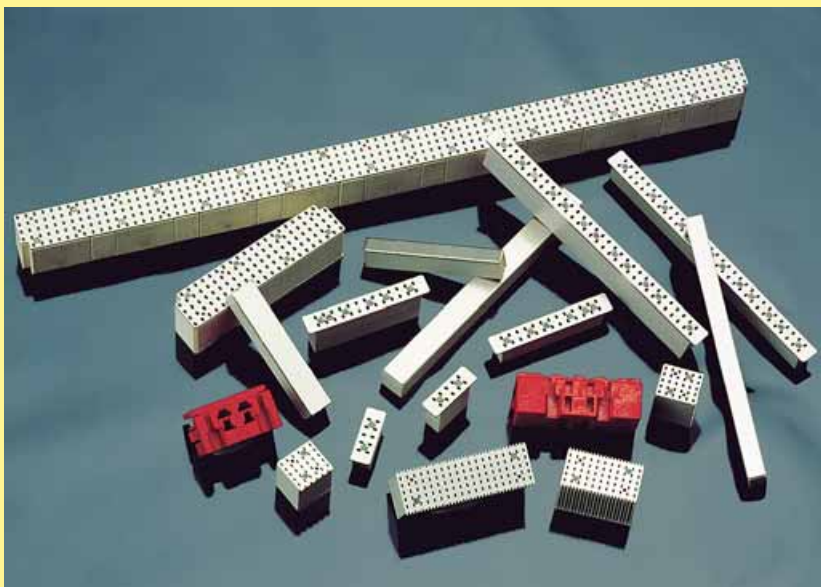
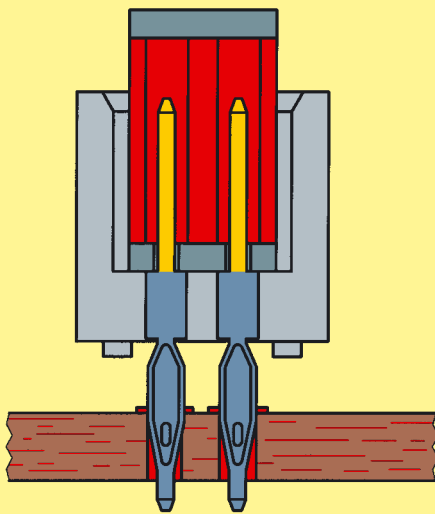


## Advantages of press inserts

Robust tooling

No lateral force to pcb hole

No abrasion of the contact mating surface by the press tool



HARTING has already developed press-in inserts for all major male connector families on 2.54 mm, 2.5 mm and 2 mm pitches.

Inserts for any other special components can be developed on request.

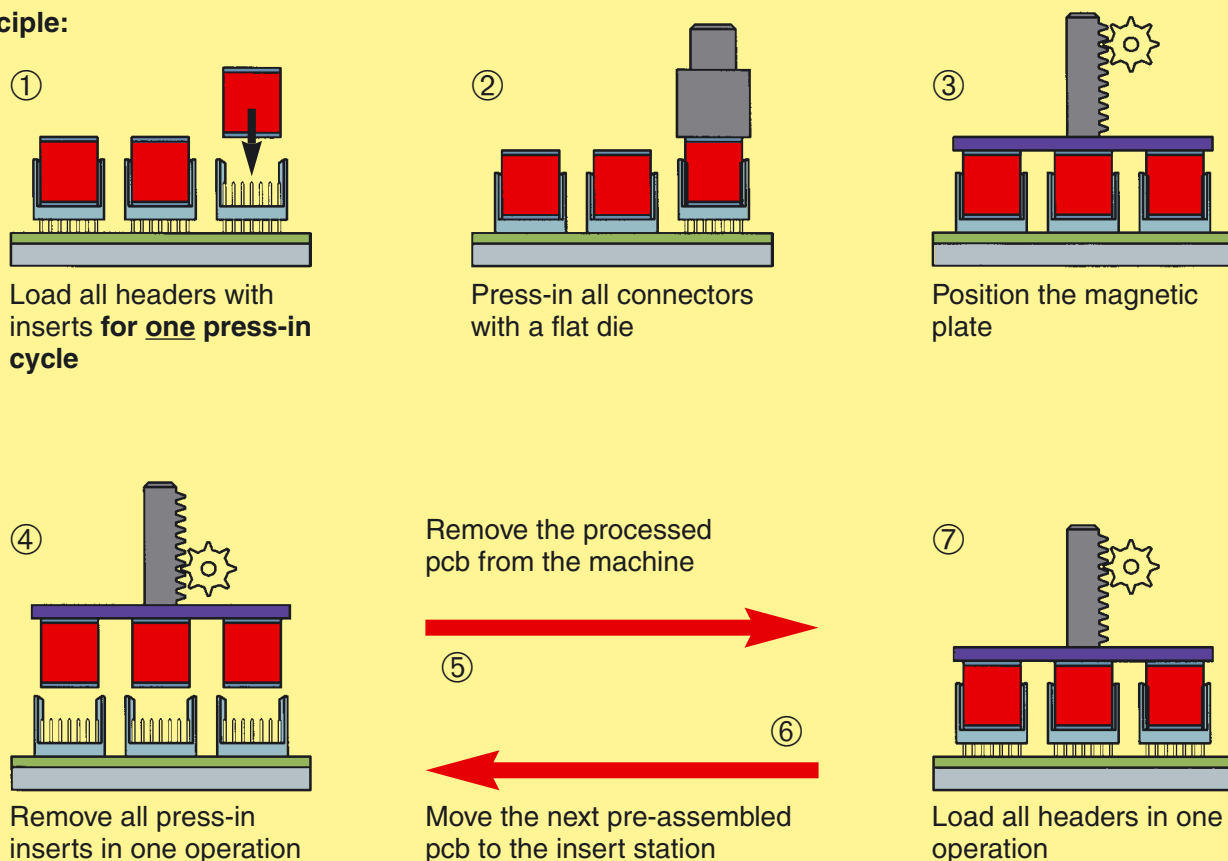
The additional process for inserting and removing the press-in inserts can be efficiently done with the insertion removal station. This station removes all press-in inserts with a magnetic plate in one operation and inserts them into the next pre-assembled pcb with the necessary precision. (Principle see page 15.17).

The cycle time for loading all headers is between 4 and 6 seconds, independent from the amount of press-in inserts.

To load the inserts automatically means also that connectors assembled in a wrong way will be recognised and errors consequently prevented.



## Principle:



The insertion removal station has been developed both for the **CPM prestige** and the CPM 2001/s. It can additionally be used as stand alone equipment.

## Insertion removal station



Power supply 220 V / 50 Hz  
Air pressure 6 bar (15-16 l/min.)

Part No. **09 89 020 0070**  
for pcb dimensions  
of max.  
710 mm x 540 mm

Part No. **09 89 020 0060**  
for pcb dimensions  
of max.  
1000 mm x 600 mm

Fig. 14: Bestseller **CPM prestige** with insertion removal station, adaptable to all HARTING press-in machines.







Solderless termination for connectors has proven to be reliable for decades. Today the use of press-in connectors encompasses all fields of electrical and electronic applications.

Pressing of electrical components, mainly connectors, is characterised through the matching of the connector pin and the plated through hole of the pcb. Whereas the desired electrical characteristics can be attained relatively independent from the design of the press-in zone, the mechanical characteristics of the press-in zone are crucial for the reliable assembly of connectors where pcb's have different finishes.

Although the scope of requirements during the press-in process is generally defined in time-tested specifications, the novel press-in zones should offer an optimal handling and a reliable termination. Essentially, this is guaranteed through the design of the press-in zone and the meticulous observance of tolerances. HARTING has been using FEM simulations for the calculation and optimisation of press-in zones for a long period of time. This expertise allows us to simulate various pcb configurations accurately.

The **harbus<sup>®</sup> HM** press-in zone is based on the industry renowned needle eye technology. Its special design allows for compensation of tolerances of pcb surface properties (eg. superfluous tin plating). The excessive material is displaced within the plated through hole, whereby a gas-tight and corrosion resistant electrical connection is assured.

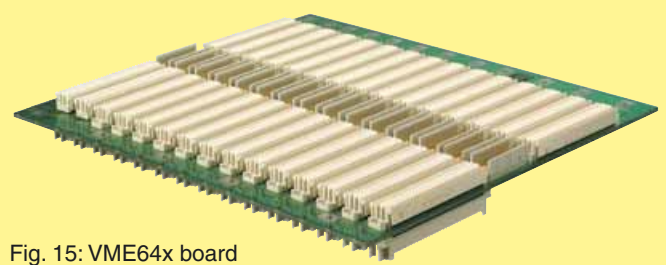


Fig. 15: VME64x board

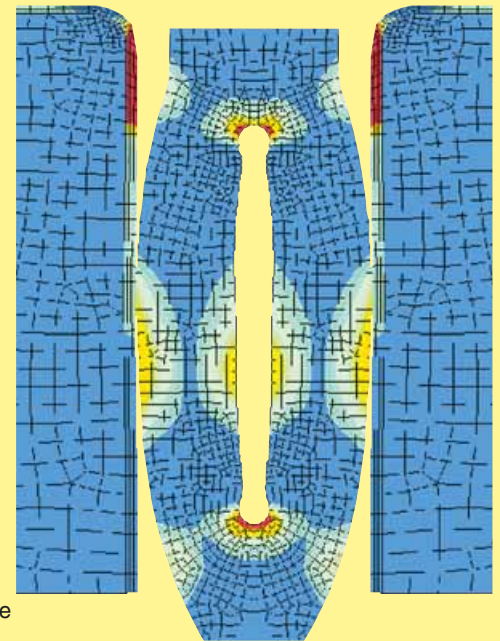


Fig. 16: FEM simulation of the needle eye press-in zone

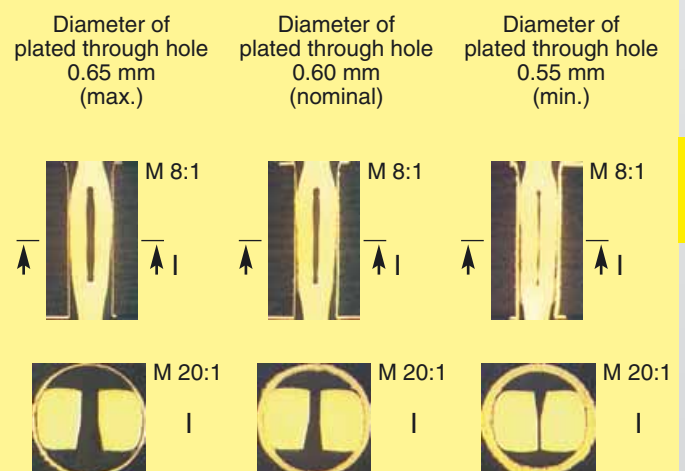


Fig. 17: Cross section of a pcb 2.4 mm thick with various hole diameters

Due to the high deformation capability and resilience of **harbus<sup>®</sup> HM** press-in contacts, they can be easily and repeatedly removed in case of repairs without impairment to their functioning.

Today tinned surfaces are widely used as a standard, the pcb technology trends are moving to low tin or tin free surfaces. Cu, Pd, Au and Ag are the important alternatives. Specific parameters and particularly different friction factors of these surfaces make high demands on press-in zones.

**harbus<sup>®</sup> HM** press-in contacts are extremely versatile and offer a reliable electrical contact, therefore they are especially well suited for applications with these surfaces.

Please contact us for detailed test reports.

## Benefits of press-in technology

- Thermal shocks associated with the soldering process and the risk of the board malfunction are avoided.
- No need for the subsequent cleaning of the assembled pcb's
- Unlimited and efficient processing of partially gold-plated pins for rear I/O - manual soldering is no longer necessary!

## Recommended configuration of plated through holes for tinned pcb's

Diameter of holes:  $0.6 \pm 0.05$  mm

Pcb thickness: 1.4 mm min.

Configuration: Drilling:  $0.7 \pm 0.02$  mm  
Cu: 30 - 50  $\mu$ m  
SnPb: 5 - 15  $\mu$ m

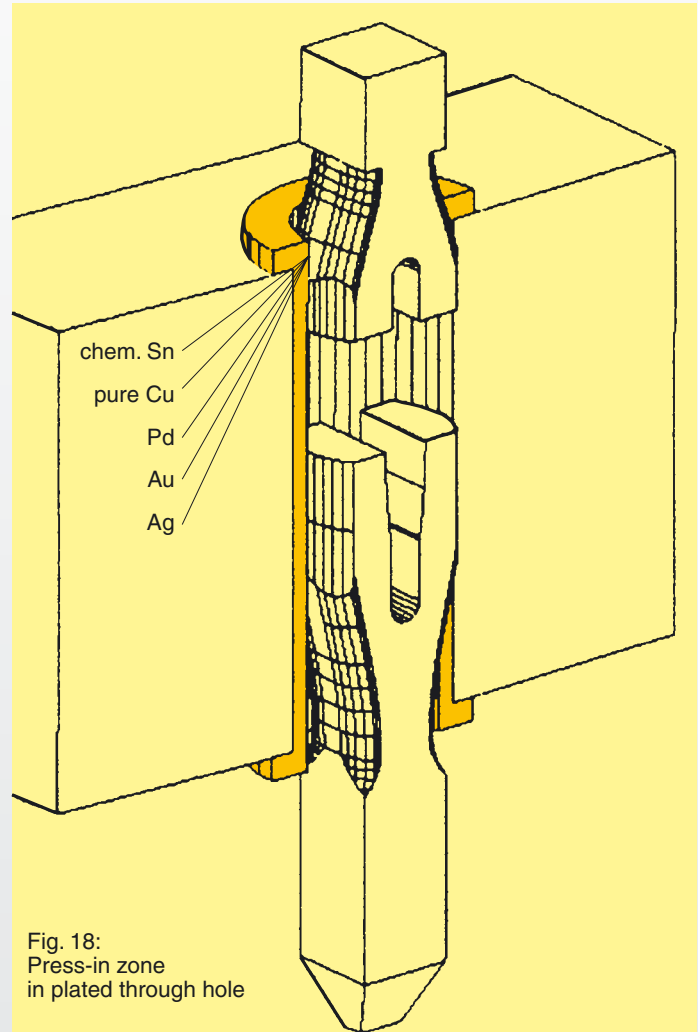


Fig. 18:  
Press-in zone  
in plated through hole

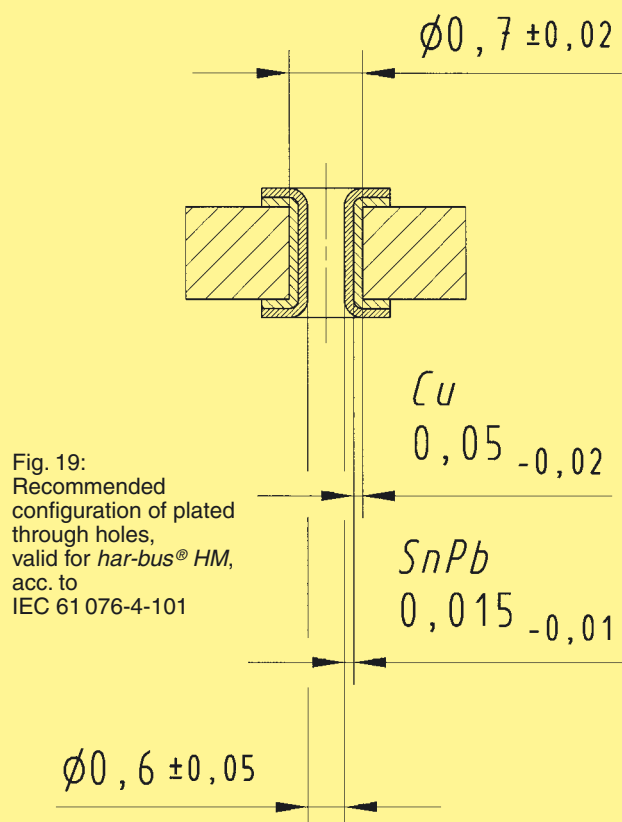
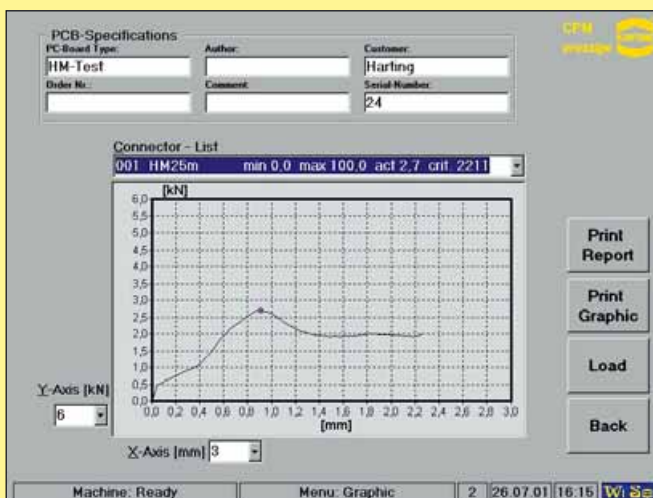


Fig. 19:  
Recommended  
configuration of plated  
through holes,  
valid for **harbus<sup>®</sup> HM**,  
acc. to  
IEC 61 076-4-101

## Quality control of press-in termination

The press-in force correlates with the diameter of the plated through hole and with the friction coefficient of the surface; therefore it can be used for a continuous monitoring of the process.

The retention force, as an indirect measure of the normal force, serves to qualify the process or random tests



HARTING assists you with the most advanced quality assurance methods beyond the usual scope.

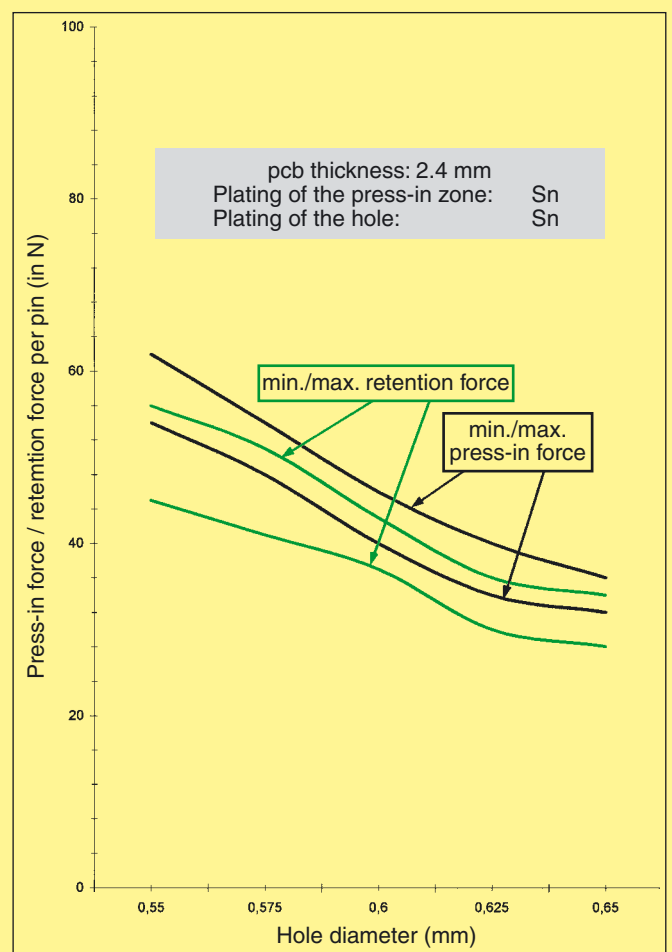


Fig. 20: Typical press-in and retention forces for the har-bus® HM press-in zone

The automatic press-in machines of HARTING feature a graphical user interface for monitoring the process and the quality of the press-in termination.

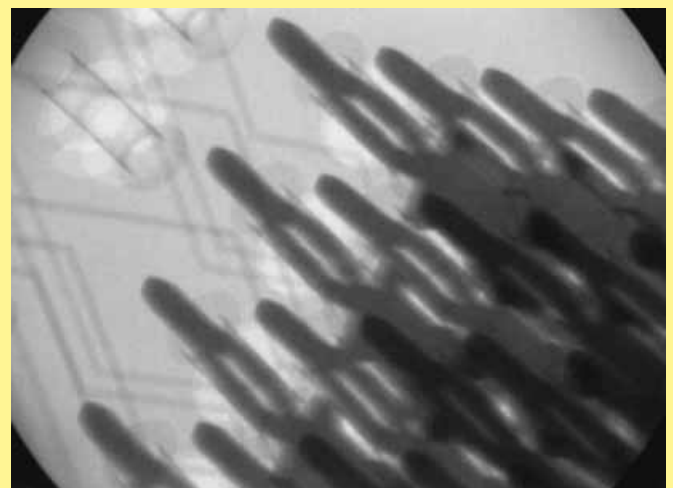


Fig. 21: X-ray photo of a pressed-in connector



Should you need a specially loaded connector for your application please use this request form. Fill out the drawing for the desired connector style and mark each position with the required contact length (A, B, ..., S, T).

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Columns labeled at bottom: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 (from right to left)

Rows labeled on right: a, b, c, d, e, f, g, h, i, j (from top to bottom)

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02



| Part No.       | Page  | Part No.       | Page  | Part No.       | Page  | Part No.       | Page  | Part No.       | Page  |
|----------------|-------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|
| 07 00 111 7015 | 09.18 | 07 01 711 7015 | 09.06 | 07 02 712 7015 | 09.08 | 07 05 413 7015 | 09.14 | 07 11 010 0015 | 09.27 |
| 07 00 111 8015 | 09.18 | 07 01 711 8015 | 09.06 | 07 02 712 7016 | 09.10 | 07 05 413 8015 | 09.14 | 07 11 100 0023 | 10.09 |
| 07 00 112 7015 | 09.18 | 07 01 712 7015 | 09.06 | 07 02 712 8015 | 09.08 | 07 05 414 7015 | 09.14 | 07 11 100 0024 | 10.09 |
| 07 00 112 8015 | 09.18 | 07 01 712 8015 | 09.06 | 07 02 712 8016 | 09.10 | 07 05 414 8015 | 09.14 | 07 11 100 0026 | 10.09 |
| 07 00 113 7015 | 09.18 | 07 01 713 7015 | 09.06 | 07 02 713 7015 | 09.08 | 07 05 611 7015 | 09.14 | 07 11 100 0027 | 11.05 |
| 07 00 113 8015 | 09.18 | 07 01 713 8015 | 09.06 | 07 02 713 7016 | 09.10 | 07 05 611 8015 | 09.14 | 07 11 900 0023 | 10.09 |
| 07 00 114 7016 | 09.18 | 07 01 714 7015 | 09.06 | 07 02 713 8015 | 09.08 | 07 05 612 7015 | 09.14 | 07 11 900 0024 | 10.09 |
| 07 00 114 8016 | 09.18 | 07 01 714 8015 | 09.06 | 07 02 713 8016 | 09.10 | 07 05 612 8015 | 09.14 | 07 11 900 0031 | 11.05 |
| 07 00 411 7015 | 09.18 |                |       | 07 02 714 7015 | 09.08 |                |       | 07 11 900 0032 | 11.05 |
| 07 00 411 8015 | 09.18 |                |       | 07 02 714 7016 | 09.10 | 07 05 613 7015 | 09.14 |                |       |
| 07 00 412 7015 | 09.18 | 07 02 111 7015 | 09.08 | 07 02 714 8015 | 09.08 | 07 05 613 8015 | 09.14 | 07 20 119 7015 | 09.26 |
| 07 00 412 8015 | 09.18 | 07 02 111 7018 | 09.10 | 07 02 714 8016 | 09.10 |                |       | 07 20 119 8015 | 09.26 |
|                |       | 07 02 111 8015 | 09.08 |                |       | 07 05 614 7015 | 09.14 |                |       |
| 07 00 413 7015 | 09.18 | 07 02 111 8018 | 09.10 | 07 04 111 7015 | 09.12 | 07 05 614 8015 | 09.14 | 07 20 219 7015 | 09.26 |
| 07 00 413 8015 | 09.18 |                |       | 07 04 111 8015 | 09.12 |                |       | 07 20 219 8015 | 09.26 |
|                |       | 07 02 112 7015 | 09.08 |                |       | 07 05 711 7015 | 09.14 |                |       |
| 07 00 414 7015 | 09.18 | 07 02 112 7016 | 09.10 | 07 04 112 7015 | 09.12 | 07 05 711 8015 | 09.14 | 07 20 319 7015 | 09.26 |
| 07 00 414 8015 | 09.18 | 07 02 112 8015 | 09.08 | 07 04 112 8015 | 09.12 |                |       | 07 20 319 8015 | 09.26 |
|                |       | 07 02 112 8016 | 09.10 |                |       | 07 05 712 7015 | 09.14 |                |       |
| 07 00 611 7015 | 09.18 | 07 02 113 7015 | 09.08 | 07 04 113 7015 | 09.12 | 07 05 712 8015 | 09.14 | 07 20 819 7015 | 09.26 |
| 07 00 611 8015 | 09.18 | 07 02 113 7016 | 09.10 | 07 04 113 8015 | 09.12 |                |       | 07 20 819 8015 | 09.26 |
| 07 00 612 7015 | 09.18 | 07 02 113 8015 | 09.08 | 07 04 114 7015 | 09.12 | 07 05 713 7015 | 09.14 |                |       |
| 07 00 612 8015 | 09.18 | 07 02 113 8016 | 09.10 | 07 04 114 8015 | 09.12 | 07 05 713 8015 | 09.14 |                |       |
|                |       |                |       |                |       |                |       |                |       |
| 07 00 613 7015 | 09.18 | 07 02 114 7015 | 09.08 | 07 04 411 7015 | 09.12 | 07 05 714 7015 | 09.14 | 07 21 119 7015 | 09.20 |
| 07 00 613 8015 | 09.18 | 07 02 114 7017 | 09.10 | 07 04 411 8015 | 09.12 | 07 05 714 8015 | 09.14 | 07 21 119 8015 | 09.20 |
| 07 00 614 7015 | 09.18 | 07 02 114 8015 | 09.08 | 07 04 412 7015 | 09.12 |                |       | 07 21 219 7015 | 09.20 |
| 07 00 614 8015 | 09.18 | 07 02 114 8017 | 09.10 | 07 04 412 8015 | 09.12 |                |       | 07 21 219 8015 | 09.20 |
|                |       |                |       |                |       | 07 09 111 7015 | 09.16 |                |       |
| 07 00 711 7015 | 09.18 | 07 02 411 7015 | 09.08 | 07 04 413 7015 | 09.12 | 07 09 111 8015 | 09.16 | 07 21 319 7015 | 09.20 |
| 07 00 711 8015 | 09.18 | 07 02 411 7017 | 09.10 | 07 04 413 8015 | 09.12 |                |       | 07 21 319 8015 | 09.20 |
| 07 00 712 7015 | 09.18 | 07 02 411 8015 | 09.08 | 07 04 414 7015 | 09.12 | 07 09 112 7015 | 09.16 | 07 21 819 7015 | 09.20 |
| 07 00 712 8015 | 09.18 | 07 02 411 8017 | 09.10 | 07 04 414 8015 | 09.12 | 07 09 112 8015 | 09.16 | 07 21 819 8015 | 09.20 |
|                |       |                |       |                |       |                |       |                |       |
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|                |       | 17 33 000 4102 | 03.17 | 17 79 000 0012 | 06.02 | 17 99 000 0055 | 15.02 |                |       |
| 17 23 000 4102 | 01.18 | 17 33 095 1101 | 01.20 | 17 79 000 0013 | 06.02 | 17 99 000 0056 | 15.02 |                |       |
| 17 23 000 4102 | 01.21 | 17 33 095 1101 | 03.17 | 17 79 000 0014 | 06.02 | 17 99 000 0057 | 15.02 |                |       |
| 17 23 000 4102 | 03.15 | 17 33 095 1102 | 01.20 | 17 79 000 0015 | 06.02 | 17 99 000 0058 | 15.04 |                |       |
| 17 23 000 4102 | 03.18 | 17 33 095 1102 | 03.17 | 17 79 000 0016 | 06.02 | 17 99 000 0059 | 15.04 |                |       |
|                |       | 17 33 095 2101 | 01.20 | 17 79 000 0018 | 06.02 | 17 99 000 0060 | 15.02 |                |       |
| 17 23 055 1101 | 01.21 | 17 33 095 2101 | 03.17 | 17 79 000 0019 | 06.02 | 17 99 000 0061 | 15.02 |                |       |
| 17 23 055 1102 | 01.21 | 17 33 095 2102 | 01.20 | 17 79 000 0020 | 06.02 | 17 99 000 0063 | 15.05 |                |       |
| 17 23 055 1801 | 05.07 | 17 33 095 2102 | 03.17 | 17 79 000 0022 | 06.02 | 17 99 000 0065 | 15.05 |                |       |
| 17 23 055 1802 | 05.07 |                |       | 17 79 000 0023 | 06.02 | 17 99 000 0066 | 15.05 |                |       |

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| 17 05 133 1602 | 04.04 | 17 11 176 2201 | 02.02 | 17 15 125 2201 | 01.12 | 17 24 000 4102 | 03.16 |
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| 17 05 133 1603 | 03.08 | 17 11 220 1001 | 02.02 | 17 15 169 1201 | 01.12 |                |       |
| 17 05 133 2002 | 01.10 | 17 11 220 1201 | 02.02 | 17 15 169 2201 | 01.12 | 17 24 110 1101 | 01.19 |
| 17 05 133 2002 | 03.08 | 17 11 220 2001 | 02.02 |                |       | 17 24 110 1101 | 03.16 |
| 17 05 133 2004 | 01.10 | 17 11 220 2201 | 02.02 |                |       | 17 24 110 1102 | 01.19 |
| 17 05 133 2004 | 03.08 |                |       |                |       | 17 24 110 1102 | 03.16 |
| 17 05 133 2005 | 01.10 |                |       | 17 21 000 4102 | 01.18 | 17 24 110 1801 | 05.06 |
| 17 05 133 2005 | 03.08 |                |       | 17 21 000 4102 | 01.20 | 17 24 110 2101 | 01.19 |
| 17 05 133 2201 | 01.09 |                |       | 17 21 000 4102 | 03.15 | 17 24 110 2101 | 03.16 |
| 17 05 133 2201 | 04.03 | 17 12 200 1201 | 02.03 | 17 21 000 4102 | 03.17 | 17 24 110 2102 | 01.19 |
| 17 05 133 2203 | 01.09 | 17 12 200 2201 | 02.03 |                |       | 17 24 110 2102 | 03.16 |
| 17 05 133 2203 | 04.03 |                |       | 17 21 090 1103 | 01.18 | 17 24 110 2801 | 05.06 |
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| 17 05 133 2603 | 01.11 | 17 12 250 2001 | 02.03 | 17 21 090 2103 | 03.15 |                |       |
| 17 05 133 2603 | 03.08 | 17 12 250 2201 | 02.03 |                |       | 17 25 000 4102 | 01.19 |
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|                |       |                |       | 17 21 110 1102 | 03.15 | 17 25 095 1101 | 01.19 |
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|                |       |                |       | 17 21 110 2102 | 03.15 | 17 25 095 1102 | 04.05 |
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| 17 06 308 2201 | 03.12 | 17 14 110 1201 | 01.13 |                |       |                |       |
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| 17 06 308 2203 | 03.13 | 17 14 110 2201 | 01.13 |                |       | 17 26 200 2103 | 03.18 |
| 17 06 308 2204 | 03.12 | 17 14 110 2201 | 03.10 |                |       |                |       |
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| 17 33 000 4102 | 03.17 | 17 70 000 6001 | 06.06 | 17 99 000 0019 | 07.03  |                |       |
|                |       | 17 70 000 6002 | 06.06 | 17 99 000 0020 | 07.03  | 27 11 169 8001 | 12.05 |
| 17 33 095 1101 | 01.20 | 17 70 000 6003 | 06.06 | 17 99 000 0021 | 07.03  | 27 11 169 8002 | 12.05 |
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| 17 33 095 1102 | 03.17 | 17 70 000 7002 | 06.06 | 17 99 000 0024 | 07.03  |                |       |
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| 17 34 110 1102 | 03.17 | 17 79 000 0014 | 06.02 | 17 99 000 0038 | 07.04  |                |       |
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| 17 34 110 2101 | 03.17 | 17 79 000 0016 | 06.02 | 17 99 000 0040 | 07.04  |                |       |
| 17 34 110 2102 | 01.20 | 17 79 000 0017 | 06.02 | 17 99 000 0041 | 07.04  | 27 79 000 0001 | 12.05 |
| 17 34 110 2102 | 03.17 | 17 79 000 0018 | 06.02 | 17 99 000 0042 | 07.04  | 27 79 000 0002 | 12.05 |
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|                |       | 17 79 000 0021 | 06.02 | 17 99 000 0045 | 07.04  |                |       |
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| 17 35 125 1102 | 01.20 | 17 79 000 0023 | 06.02 | 17 99 000 0047 | 07.04  |                |       |
| 17 35 125 2101 | 01.20 | 17 79 000 0024 | 06.02 | 17 99 000 0048 | 07.04  |                |       |
| 17 35 125 2102 | 01.20 | 17 79 000 0025 | 06.02 | 17 99 000 0049 | 07.04  |                |       |
|                |       | 17 79 000 0026 | 06.02 | 17 99 000 0050 | 07.04  |                |       |
|                |       | 17 79 000 0027 | 06.02 | 17 99 000 0051 | 07.04  |                |       |
|                |       | 17 79 000 0028 | 06.02 | 17 99 000 0052 | 07.02  |                |       |
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| 17 70 000 1003 | 06.04 |                |       | 17 99 000 0055 | 07.02  |                |       |
| 17 70 000 1004 | 06.04 |                |       | 17 99 000 0056 | 07.02  |                |       |
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| 17 70 000 2002 | 06.05 | 17 99 000 0002 | 07.06 | 17 99 000 0058 | 07.04  |                |       |
| 17 70 000 2003 | 06.05 | 17 99 000 0003 | 07.06 | 17 99 000 0059 | 07.04  |                |       |
| 17 70 000 2004 | 06.05 | 17 99 000 0004 | 07.06 | 17 99 000 0060 | 07.02  |                |       |
| 17 70 000 3001 | 06.07 | 17 99 000 0005 | 07.06 | 17 99 000 0061 | 07.02  |                |       |
| 17 70 000 3002 | 06.07 | 17 99 000 0006 | 07.06 | 17 99 000 0063 | 07.05  |                |       |
| 17 70 000 3003 | 06.07 | 17 99 000 0007 | 07.06 | 17 99 000 0065 | 07.05  |                |       |
| 17 70 000 3004 | 06.07 | 17 99 000 0008 | 07.06 | 17 99 000 0066 | 07.05  |                |       |
| 17 70 000 4001 | 06.05 | 17 99 000 0009 | 07.06 | 17 99 000 0068 | 07.05  |                |       |
| 17 70 000 4002 | 06.05 | 17 99 000 0012 | 07.02 | 17 99 000 0069 | 07.06  |                |       |
| 17 70 000 4003 | 06.05 | 17 99 000 0013 | 07.02 | 17 99 000 0070 | 07.06  |                |       |
| 17 70 000 4004 | 06.05 | 17 99 000 0014 | 07.03 | 17 99 000 0071 | 07.06  |                |       |
| 17 70 000 5001 | 06.05 | 17 99 000 0015 | 07.03 | 17 99 000 0072 | 07.06  |                |       |
| 17 70 000 5002 | 06.05 | 17 99 000 0016 | 07.03 | 17 99 000 0073 | 07.02  |                |       |
| 17 70 000 5003 | 06.05 | 17 99 000 0017 | 07.03 | 17 99 000 0074 | 07.02  |                |       |



## Production plants – worldwide



Espelkamp / Germany – Plant 1



Espelkamp / Germany – Plant 2



Espelkamp / Germany – Plant 3



Espelkamp / Germany – Plant 4



Espelkamp / Germany – Plant 5



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